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EDITORIAL NOTES.

Thomas Newbigging.

FULL of years, revered and honoured by all men who knew him personally, by repute, or through his work and writings, Thomas Newbigging has been laid to his final rest. Professional gas men throughout the United Kingdom must have paused in the daily round with thoughts saddened as they read the announcement that duty last week called upon us to make, and made it was with the deepest sorrow, that a life bound up by numerous years and (until latterly) distinguished by incessant work for the industry had closed—a life made what it was by manifold accomplishments and striking characteristics such as are rare in any single individual. The name has been interwoven with prominence in the history of the industry perhaps for a longer period than that of any other single living individual; and it has been maintained, by a vigorous personality and excellent work, among the names of that small band of men who may be cited as leaders in the industry's technical life.

Upon the minds of those who read the announcement, and the epitomized account of a full life's work, published last week, thoughts and memories must have crowded and jostled each other in which Thomas Newbigging was the central figure. They do so to-day as we write; for we look down a long avenue of years of friendship and of intimacy beyond that produced by mere business relations brought about by the publishing of certain of the gifts that he whose pen is now laid aside made to the gas industry. The friendship and intimacy to-day grant freedom to the pen. But the composite character of the subject is the greatest bar to complete descriptive justice. We know the character well; for numerous years it has been open to us as a book. Yet the true portrayal of it is a hard task. Thomas Newbigging had an individuality all his own. Engineer, consultant, arbitrator, witness, scholar, *littérateur*, philosopher, counsellor, friend, and gentleman. There we have imperfectly stated and placed the outlines of the qualities and brilliant accomplishments of him who has passed from our midst. Strong and vigorous of intellect, and practical in all things, he took a broad outlook upon life. He enjoyed life; he enjoyed the world as he found it; he enjoyed the interest that work and the things around him created for him through his observant and discerning nature. He found in both work and the life about him at once the means of profitably using his talents, and of largely giving to his versatile nature its recreation. When life such as this is the case, the burden for a man is that of inactivity; and so it was when the advancing years urged the renunciation of the obligatory activity of a professional life. But even in the comparatively few years of retirement, the spirit was unquenchable; and the development of those things in which he had had part during the days of professional activity continued to interest him, and his pen, driven perhaps a little more slowly than in the days gone by, continued its supply from the large fount of experience and wisdom, and stores of observation—giving delight to the author, to those who sought to learn from him, and to those who read (apart from engineering and management) in order to imbibe some of that broad and guiding philosophy which permeated his writings, or who read in order to obtain entertainment from, and insight upon, the lighter side of his studies of those of the county in which he largely lived and moved.

But our view of him must perforce go to that side on which the gas industry knows him best, and on which monumental work was done. The keen, robust intellect, it is a pleasure to know, enabled him to the end to keep pace with the course of events in the industry; and within a few days of the close of life he was picturing himself again in the familiar witness chairs at Westminster, and discussing the latest phase of industrial topic and policy—calorific value. Those who were present nigh twelve months ago at the Jubilee meeting of the Institution of Gas Engineers can easily recall to mind now the venerable figure, with bent shoulders, patriarchal beard, keen eyes, and in them the glint of merriment as a sample of the old pointed wit escaped his lips, standing before them when the gas profession was honouring him as the surviving founder of the Institution. He looked then, as we like respectfully to think of him as, the G.O.M. of the gas industry. Now that the voice, slightly tremulous then with age, is no more, some words are remembered that appeared then to convey some regret that the time was not far hence when he would not be here to take part or even interest in the larger work lying before the gas industry. "I "was an engineer," he proudly said, "before one-half of "those present were born." But, he added, "you have the "better of me in the long run; you will be at work when I "am gone." No shrinking there from the unavoidable truth. There, however, was the insatiable character—the character that found joy in the recollections of the life that had been, but the character that wanted to be, and would have been were it physically possible, of still greater service, and only for the very love of activity and usefulness.

The gas profession mourns the loss of a man who gave generously, and worked generously, for it and the industry. Benevolence was in his very work. He was so much the servant of the profession and the industry. He was an engineer, but not an inventor. He, as are aware those many clients who consulted him, had the faculty of applying to the best advantage the science of his profession in construction and operation; and he never allowed his knowledge to be behind the times. The instinct of the scholar was with him to the end. He was always prepared to learn, and always ready to recast his experience in the moulds derived from fresh advancement along the industry's technical, political, or commercial lines. This was one secret of his success in professional life. His editing of "King's Treatise on the "Science and Practice of the Manufacture and Distribu-"tion of Coal Gas" and the several editions of his "Hand-"book for Gas Engineers and Managers" were the best possible attestations to the breadth and depth of his professional knowledge and interests. As a consultant he was circumspect; and there were few who did not act upon his prudent advice. If they did not, they often found after-cause to regret it. Enthusiastic for reform, he always advocated caution and not violent measures in changing circumstances and policy. As an expert engineering witness, he was one whom it was preferable to have for, rather than against, one. But for or against, there was honesty in opinion and view; for he was not one to be moved to the construction, without sound materials, of an opposition case. There was conscientiousness in his actions and his words that made him largely what he was in the Parliamentary Committee rooms and in arbitrations—whatever his position, whether as arbitrator or witness, in the latter. We can hear again to-day, as memory travels haphazardly backwards over events, the rapier thrusts when hardly pressed in cross-examination. Nobody ever had much the better of Thomas Newbigging in those times, without showing very good and unforeseen cause. He was a keen controversialist. He was candid in speech; and liked to find the same ring in the coin thrown down by his opponent. Contrary judgment or opinion did not affect his friendships, as we well found, when on one occasion our views on a matter of domestic politics crossed his own as a politician—when, in other words, he made the slip of not discriminating between domestic and party politics. He could read men, and he soon knew men, and their worth. Many men have had cause to thank him for the help he rendered them, in more ways than through his invaluable books. The helping hand over the stepping-stones for many young men has been many times willingly rendered, without the whole gas industry knowing it. He was not only benefactor directly to many, but he was a benefactor indirectly through the inspiration that his own

honoured life, his work, and his words gave to others. He presents to the juniors of the industry through his life a fine exemplar.

Such was Thomas Newbigging as we knew him in his professional and public life; and all the same attributes—save the "rapier thrusts" that were supplanted by gentleness—were found in him as husband, father, and friend. He has well served a great industry, and he has left his mark upon its affairs. The world is the richer for a well-spent life; it is the poorer now that the life is closed. The name of Thomas Newbigging, however, has earned permanence in the history of the gas industry, not only of the British Isles, but wherever gas supply is established.

The Sulphate Makers' Association.

In connection with the heavy shrinkage in the market prices of sulphate of ammonia, there is one thing that is unnecessary, and that is to be unduly alarmed. On the other hand, there are two things that are necessary; and they are that sulphate of ammonia makers must not take up their residence in a Fool's Paradise, and that they must look forward and take such precautionary measures as are considered judicious and proper. Prices have of late been breaking-away at such a rapid rate that it is only prudent to look carefully into the causes, and to ascertain whether there are fresh conditions existing that call for fresh treatment. The prices that were being received in 1912, and which worked out to an average for the year of £14 7s. 9d. per ton, may be regarded as abnormal—not in relation to the unit-value of sulphate of ammonia compared with nitrate of soda, but in comparison with preceding ruling prices. The succeeding year saw an average of about £1 per ton less; but since the beginning of this year, the price has fallen away by from £1 10s. to £2—nearer the latter than the former figure. Taking the current sulphate of ammonia production of the United Kingdom from all sources at 450,000 tons a year, and reckoning a sale of 425,000 tons, a drop of £2 represents £850,000, and of £3 no less than £1,275,000. These are substantial figures. For a parallel to the present low prices, we have to go back to the opening years of the century. It may be said, and it has been used as a comforting reflection, that when prices have been as bad as they are now, they have recovered; and therefore precedent gives authority for expecting that prices will right themselves again.

Instead of taking any such optimistic view on the shallow ground of precedent, supported by the aphorism that "history " will repeat itself," it is more appropriate that the preliminary investigation should be made to ascertain whether the conditions that now exist are consistent with those which prevailed at the time of the last low level of prices. It does not call for extended examination to see that they have not much similarity. What are the facts—that since the occasion when prices were last at the low level of those ruling to-day, the annual production of sulphate of ammonia throughout the world has largely increased, and is now not far short of 1,500,000 tons. To this sum, the United Kingdom contributed about 420,000 tons last year. Ten years ago the total production of the United Kingdom was only about 230,000 tons, to which coke and producer-gas plants subscribed only about 26,500 tons, as compared with no less than 157,000 tons last year. Yet our home consumption of sulphate of ammonia last year was only about 97,000 tons, leaving (reckoning 20,000 tons in stock) exports standing at 325,000 tons. How much this country is relying on an export trade is therefore seen; and that export trade it is consequently of supreme importance to maintain, while simultaneously there must be no lessening of the activity to stimulate a larger home demand. At one time a very substantial sulphate of ammonia business was done with Germany; but Germany is now actively developing an export trade of its own. There, again, we have a condition which did not obtain at the last time of the price of sulphate being parallel with present figures.

Now, too, a new competitor is in the field, the force of whose work has already been felt in the markets, and the prospective full force is an unknown quantity. This is the comparatively recently developed system of nitrogen extraction from the atmosphere. There was at one time a disposition to look incredulously upon the process. But it appears to be a hardy thing; and a contribution to the world's supply of 30,000 tons of sulphate of ammonia one year, and of 50,000 tons the second, is a condition of things that invites respect, and a certain amount of wonder as to what the future is going to bring forth. A Company like the Badische does not enter on a business on this scale if it is likely to be a speculative or money-losing one. There is more in it than many of us know of; and at the present time it would be the height of folly to belittle the system and its possibilities. It is safer in this case to over-rate than to under-estimate. The man who over-rates the power of his opponent always comes off better than the man who under-estimates him. The secrecy existing as to the cost of production under the atmospheric-nitrogen process is regarded by some as a sign of weakness, and as an indication that the cost is higher than is rumoured. Some speak of £10, others of £4, as being the producing cost. But whatever it is, it is certain that it pays the Badische Company at the current market values, or they would not enlarge the production as they are doing. If £4 is the price of production, then that is the approximate cost of the manufacture of sulphate of ammonia on gas-works subsequent to the expense of obtaining the ammoniacal liquor, so that, securing their nitrogen from the atmosphere, the German Company are—assuming the correctness of the figures—in a superior position to the coal-carbonizing producers of sulphate of ammonia.

These considerations show that there are conditions in existence to-day which did not obtain at the time when the price was previously equivalent to that now prevailing; and therefore it is clearly wise to re-examine the situation, and to revise the elements of our operations, in order to make proper provision for watching over the British sulphate of ammonia interests, and to place those interests in a stronger position in bargaining in the markets of the world than they would be by continuing to work individually against a strong combination in another country. So examining the situation, it has latterly been made forcibly apparent to the principal British makers, and it is hoped that what we have said here will make it abundantly apparent to all makers whatever their degree, that there must be some strong form of combination—not, let us emphatically state, in the shape of a ring—to enable British producers to face, in an effective manner, the new circumstances. A scheme has been put forward; and at a meeting held at the offices of the Gas Light and Coke Company, under the Chairmanship of the General Manager (Mr. D. Milne Watson), it has been accepted by quite a number of influential makers. The meeting in itself was significant in its composition—gas, coke-oven, blast-furnace, shale-oil, colliery, and producer gas interests all being represented. The names of those present are a sufficient guarantee that they were not there to consider merely illusory changes or transient interruptions in normal conditions. The support, in fact, was such that (as was announced last week) a Sulphate of Ammonia Manufacturers' Association was there and then formed, and a Board of Management appointed, which is representative of all interests and all districts. The names of the members already elected on to the Board of Management is an assurance that business is intended, and that sulphate makers will find greater safety inside than outside the operations of an organization that, if the scheme develops as it is expected to do, will, it is believed, have far-reaching effects.

The details regarding the scheme are naturally not for general publication, but have been privately circulated. The information to hand, however, discloses quite enough to show that this is a serious movement to uphold British sulphate of ammonia trading in the world. At the present moment, there is no organization that has the power to come to any definite agreement, as to prices and so forth, with competitors in Germany. Such an organization, under the changed conditions, is imperatively necessary. No producers of sulphate of ammonia, whatever the source of production, can desire by their operations to force their competitors into such abnormally low prices that they themselves would be serious sufferers. Until the present move was made, there was no British organization in existence sufficiently powerful to make such agreements, or to do anything else that would help home producers commercially. There is the Sulphate of Ammonia Committee, which is a good propagandist organization, with an excellent record to its credit. The new Association is purely a commercial one. The Committee will have all their work cut out to develop the home demand; and the new Association proposes to help it. The time may come—when the Association has firmly settled down and by experience found its true lines of action, and improved upon the present conceptions—when the two organizations will be merged

into one. That, however, is a matter for the future. Then there is talk of pooling production, or a certain proportion of the production; and present prominent dealers will then probably come in as agents of the Association. We can in this see further reason for makers of all grades to unite themselves with the new movement. Again, where the German competitors are able to forestall us in the export markets is that, through their Syndicate, they are in a position to make long contracts forward. The new Association is destined to meet this condition. But the main thing is to have a central Association of makers that can speak authoritatively, and make arrangements with the producers of other countries.

We are satisfied that the influential promoters of the new Association intend that the scheme shall be run on a true business basis, and that it shall be a real operative force in the interests of British sulphate of ammonia producers. Believing this, we commend the new organization to the careful consideration of all producers in the coal-carbonizing industries.

Condensing, Washing, and Scrubbing.

THERE is scarcely a point about gas-works practices that is not now receiving more attention than formerly. The condensing, washing, and scrubbing plant until quite recently appeared to have subsided into formal and regular method, and beyond there seemed to be no manner of improvement worth having. This was merely a belief formed by working only to an accepted order of things, and without critical investigation to ascertain whether what was being done really gave the maximum benefit in gas quality, in purity, and in ammonia, with the maximum economy in working. From Presidential Addresses—notably by Mr. J. G. Newbigging, Mr. Thomas Glover, and Mr. William Wilson, all within the past three months—it has been seen that even in gas-works acknowledged to be the best regulated ones there is frequently, by investigation, found to be room for some profitable improvement. It was not an effect of these addresses, but of personal observation long before their delivery, that induced Mr. H. D. Madden, the Engineer of the Cardiff Gas Company, to believe that the old condensing, washing, and scrubbing plant on his works was not performing its functions in the best of possible ways, and that moreover it was expensive in its indifferent operation. A thorough investigation was made, and requirements were studied before putting down new plant. The investigations and the lines that were adopted in designing the plant were described in a paper published last week which Mr. E. H. Clarry read at the meeting of the Welsh Gas Association. The paper carries us through the whole of the work done, and recounts the results achieved in a very succinct and clear manner. We must heartily congratulate Mr. Clarry (who received his professional training under Mr. Madden) on this his maiden effort in a technical paper—at any rate, before a Gas Association. The gas product of Welsh coal is something that requires studied treatment in the condensing, washing, and scrubbing processes, owing to the thick heavy tar produced (which contains a high percentage of water), and the small percentage of light oils yielded. The thing to be aimed at, under these conditions, is first of all to remove the thick tar as quickly and effectively as possible, in order to prevent it from carrying down with it a large percentage of the light oily hydrocarbons, and so to arrange the condensation that there, again, the constituents that are beneficial in the gas shall be conserved, and not find a home in the tar wells. When we see that the Cardiff Company can from the local coals supply a gas of about 14-candle power with a "Metropolitan" No. 2 burner, and of a total heat value of about 600 B.Th.U., then it can be said that the work Mr. Clarry describes is wholly successful, and proves a good efficiency, as confirmed, if need required, by the analyses that he presents.

The new plant throughout, it is seen, is of quite ordinary type; but in the condensing, washing, and scrubbing parts of the purification process, method and details tell. In the first place, the gas is treated in one of Dr. Colman's "Cyclone" tar-extractors, which is found highly efficient, used while the gas is hot, in removing a large part of the heavy tar—this, of course, maintaining cleaner surfaces for the gas in the condensers. There is in this connection rather an interesting experience related by Mr. Clarry, of which Dr. Colman will perhaps take note. It is that, in one test with the "Cyclone" in cold weather, the percentage of light oils removed with the tar was "rather high," while a test made when the weather was warmer showed only a trace of light oils. Still with the same object, of not prejudicially affecting the calorific and illuminating constituents of the gas, the condensers were designed so as to permit of slow and gradual cooling. They can also be worked either reversibly or individually, or in parallel, in order to permit of the further removal of thick tar, without carrying down a large percentage of the oily hydrocarbons. So that all through this new installation the welfare of the gas in respect of its lighting and calorific qualities has been closely studied, and success is the result.

The principal feature of the washing and scrubbing plant is the effort that has been made to recover a good proportion of the ammonia, and to conserve it. Seal pots and storage tanks are sources of considerable waste; but, as Professor Cobb was showing the other day, all improvements in ammonia results must not be attributed to steps taken to conserve ammonia, seeing that, by the aid of modern carbonization methods, the less the gas is degraded by radiant heat and the passage through incandescent coke, the better for the ammonia yields. But in this new plant at Cardiff everything is sealed, the seal pots are covered, the storage wells are all fitted with tight manhole lids, and the liquor in the wells is covered with a thin layer of light oily tar so as to prevent evaporation. This is all to the good in preventing ammonia loss. It was Mr. William Wilson who, in his address at the informal meeting of Scottish Gas Managers, spoke of the value he had found in putting a film of ordinary paraffin oil on the surface of the liquor in his storage tank, and other engineers have spoken approvingly of the idea. In the Cardiff plant, too, the liquor is subjected to the minimum of pumping, and working economy is the result. There is nothing more to be said about what has been done in connection with this new plant when the efficiency is so clearly proved by results.

Small Works and Good Service.

FROM papers and discussions that have recently appeared, it is seen that the modern practices for the cultivation of new, and the maintenance of existing, business are percolating down to the small undertakings. But with the managements of them, the puzzle is one of adaptation. Magnitude does not come to their aid in systematizing the work, and when employing the best available talent for the purpose. They have to cut their garments according to their cloth; and it means an amount of ingenuity and scheming to attain the desired end. A single ordinary consumer is as important—perhaps more important—to the small undertaking than a single ordinary consumer is to a large undertaking; and every consumer of the small concern therefore requires just as much attention, and attention of as good a quality, as every consumer in the case of the larger concerns. In the paper on gas sales that Mr. W. C. Jackson, of Merthyr Tydfil, prepared for the recent Welsh Association meeting, he considers the matter, and shows the lines upon which he is proceeding to realize what is required. He correctly believes in advertising and canvassing; but the question is, under his limitations in respect of district and means, how he is to get the canvasser. The manager of the large undertaking would probably say that it is a mistake to employ a gas-fitter for such work. It may be so in the case of a large concern. But in the case of a small one the manager has no practical alternative to arranging work so as to get the largest gain from it, and not to have two men differently and less profitably occupied where but one would do. Mr. Jackson therefore suggests the selection of the smartest gas-fitter for canvassing, keeping him to this work two or three days a week till the periodical canvassing is accomplished; this work being supplemented by the manager calling to see the principal consumers (say) twice a year to make personal inquiries as to the working of present fixtures, and to introduce the subject of new applications of gas. Both ideas are good. But Mr. Jackson speaks of the "smartest" gas-fitter. What does he mean by the "smartest?" We take it that he refers to smartness in his work. That is essential; and so is something more. The canvasser must be the smartest gas-fitter in his dress. It would never do for a canvasser of even a small gas undertaking to make his house-to-house calls in his gas-fitting clothes. So attired he would not be a *persona grata*; and it would not be a bad thing to put the gas-fitter for the canvassing work into a uniform, which would serve as his credentials.

Mr. Jackson says that gas-burners and gas appliances,

like other things, are prone to go wrong; and he also says that the gas supply itself is liable to vary at times in its value. But later on he speaks of the importance of uniform quality and pressure; and of the fact that consumers do not always want to be regulating their burners to suit a variable supply of gas. This is a point that is really a fundamental one in good service; and if in any district it is possible to maintain uniformity in the value of the gas supply, it most surely is in the district of a small gas undertaking. There is less excuse for variation there than anywhere else. We come to the question of the promotion of the good service of appliances, and as to how far small undertakings are justified in going in the matter of maintenance. We are afraid that even in what the author calls the "side "lines" of policy—maintenance, gas-cooker hiring rates, &c., —the gas industry could not generally work to any recognized standards. Take things as they are. Cost of materials and labour vary in different districts; some concerns have through past management heavy capital accounts; sliding-scale undertakings have different standard prices. Not all gas concerns can therefore charge such an inclusive sum for gas, that all outgoings for good service can be included in it without the price acting to retard some householders from developing the domestic use of gas. The expense of whatever is done for a consumer has to be paid for from some source. If the price of gas is at such a point that (say) 2d. per 1000 cubic feet can be kept in it to go towards the payment for promoting the good service of appliances, so much the better. But if it cannot be without detriment to the sale of gas, so much the worse for the undertaking. A good principle, however, to follow is to make the charge for the maintenance of appliances as low as possible, and not to look for profit in this direction—always remembering that satisfaction is the best promoter and defender of gas sales, from which the profit is principally drawn.

Liberal views are held by Mr. Jackson in most directions; he falls away from the faith that is in him in one particular. He has a charge of 2d. a month per burner for cleaning glassware, regulating burners, and renewing mantles—the mantles being of the very best type. The average cost with mantles at 4½d. each and labour at 6d. an hour works out at 1·72d. per burner per month. The charge of 2d. is moderate for the service rendered in return; and we are not surprised to see that the system has made "wonderful" strides since the charge was reduced from 3d. to 2d. Were we in Mr. Jackson's shoes, there would be an inclination to be content with furthering efforts in promoting maintenance on these lines, notwithstanding that a majority of the consumers are still reluctant to place their burners under the maintenance system. The testimony of the good lights of those on maintenance should do much to support the progress made by the scheme, without undertaking the work at a small loss. A reduction of the 2d. would not, in our opinion, bring many more consumers under maintenance; but if the price of gas would stand a small loss, increasing the service, and making the system more attractive, it might of course be helpful. In the case of gas fires and radiators, a man is sent round each autumn to put them in order; and the charge is made on bare cost. Gas fires and radiators are not yet let out on hire at Merthyr, but are sold on the hire-purchase system. From experience elsewhere, it is our opinion that Mr. Jackson is making a mistake in this. A good system is to charge hire for gas-fires in the winter, and not in the two summer quarters; and to fix free all fires ordered during the summer quarters. While the author advocates attention to gas burners, fires, radiators, and gas-engines, he seems to find perfect delight in the fact that he does not clean and repair cookers. This is where he falls away from the principles of good service that he lays down in connection with other appliances. Only a limited number of gas-cookers are kept for hire purposes; the hire-purchase system being the one favoured and pushed. In this Mr. Jackson is of opinion that he is doing a good thing; the reason being that "we "have no bogey of cleaning and repairs expenses looming "up in the future, nor yet the sight of large stocks of cookers "lying in our yard awaiting cleaning." Of all gas appliances that should be kept up to a high state of efficiency and cleanliness, the cooker stands second to none. Of all gas appliances, the one that is an abomination to our nostrils, and so, we take it, to other people's, is an unclean, disagreeable odour-emitting cooker. We see no ground for delight in the hire-purchase of cookers relieving a gas undertaking from maintaining their excellence of service. But we can see that the attitude in regard to cookers is not a logical one for the author of the words: "Give good service at the "cheapest possible cost to your customer; and remember "always that you have a competitor in the market against "you."

Works' Costs on Thermal Value.

Holidays intercepted an acknowledgment of the explanatory paragraph on this subject that appeared at the end of Mr. W. M. Carr's communication published last week (p. 647), and of the tacit agreement with the criticism made of the thermal value suggestion the previous week (p. 552). Let us remind readers that the suggestion was presented by Mr. Carr in the following terms: "The net cost per 1000 cubic feet is not always a comparable figure as it does not allow for varying qualities. It is possible, however that, when the calorific standard becomes general, and records by means of accurate recording calorimeters are available, the results will be figured on the cost *per million thermal units*." In criticizing the idea, we pointed out that working results and costs must have relation to (in addition to quality) a definite quantity of raw material handled, and to the unit of measurement on which the primary product is sold. The reasons were stated. Without specifically saying so, Mr. Carr has now withdrawn from the "per million thermal units" basis standing alone. Submitting that the quality of gas varies as the quantity produced from a given coal, he now says: "With a known quality of coal, the thermal units *per ton* would give a better idea of the results from the carbonizing point of view." Knowing the coal and the total B.Th.U. produced *per ton*, it is easy then to agree that "costs per million thermal units, in conjunction with cost per 1000 cubic feet, give a better idea as to the actual commercial value that is being obtained from a gas consumer's point of view, as well as from the gas maker's."

Low-Temperature Carbonization Revival.

After the Del Monte outburst (followed promptly by the prospectus and flotation of a Company), there comes more news of fresh developments, which show that hopes of the technical application of low-temperature carbonization to the production of big commercial successes are not by any means dead. The anticipations are of such a serious and magnificent order that flights are made with the greatest ease and boldness from experimental plants of the laboratory order to plants of a working capacity of 500 tons of coal per day. We should not feel particularly comfortable in recommending, on the mere verdict of a trial plant, a flight from the one extreme to the other in this fashion. Last week's issue of the "JOURNAL" also indicated that "Coalite" was not actually dead, but had only been sleeping. Proceeding under the ample cloak of the old Silkstone Collieries, with dealers in tar and other derivatives of coal distillation ready to take the secondary products, the Barnsley Smokeless Fuel Company, under agreement with the British Coalite Company, are proposing to run a 200-ton plant at the collieries of the Company in question. This is a piece of intelligence the development of which will be watched with considerable interest. On the point as to whether there will ever be a market for any considerable quantity of smokeless fuel of the quality and at the price that will be demanded for it, we retain our old doubts. There has not been anything to cause us to alter our opinion. Perhaps the Old Silkstone collieries know where they can place the smokeless product. Anyway the 200-ton plant shows confidence.

Two Detracting Circumstances.

But there are already two flies in the Del Monte ointment. In Mr. Butterfield's report on the system, he took credit for £12 1s. 6d. per ton of sulphate of ammonia; our market reports to-day (we regret to say) exhibit a very serious decline from that price—making a difference of several thousand pounds to the bad in the estimates. There is also the development of the German process for making sulphate of ammonia at a cheap rate (*ante*, p. 636); and of this sight should not be lost. Another point is the reports as to the luxuriant yields of oils from fresh wells and experimentally on new territory. This will not improve the position of things for those low-temperature carbonization processes that are relyIng upon oil as the prime product. The Anglo-Persian Oil Company (in which the Government are investing £2,200,000 in order to give them a voting majority, and to enable the carrying-out of a contract for the supply of oil fuel to the

Admiralty on secret terms) report that certain of their wells are now yielding so prolifically that they are compelled to burn the surplus production which they cannot shut in or deal with at the present time, amounting to some 150,000 tons a year. From other quarters, there are developments in oil-yielding territories; and with the augmenting means of transport, the supply of oil ought before long to be far more abundant and still lower in price—despite the increasing use—although, of course, no one can say what are going to be the effects of future vacillatory movements between supply and demand. It is suggested by a "Coal Owner," who will not permit the publication of his name, that the Government are also thinking of going in for the low-temperature carbonization business, and are contemplating the purchase of a British coal-field—the object being to produce oil from coal. The "Coal Owner" shrewdly remarks that it will take some time before the scheme can be brought into working order, so that the Government are wise in providing an interim supply of fuel oil from abroad. The £2,200,000 investment, the elaborate precautions in connection with the oil contract, and the maintenance of the secrecy of its terms, suggest that other words than "interim supply" would be more appropriate.

Advisory Councils.

There are members of the gas industry who hope that the statement in the report of the Council of the Institution of Gas Engineers, concerning the at present inconclusive outcome of the conferences between representatives of the Institution, the Society of British Gas Industries, and the British Commercial Gas Association as to the establishment of a Central Advisory Council do not mean the indefinite shelving of the question. The President of the Institution (Mr. Edward Allen, M.Inst.C.E.) has this matter very close at heart; and he has been active in connection with it, holding as he does a very strong belief in the useful place that such a Central Advisory Council could and would fill. While the gas industry is fluttering about round the question—through a few being afraid of this, and a few of that—the Executive Committee of the Miners' Federation, and representatives of the National Union of Railwaymen, and of the Transport Workers' Federation, have been jointly conferring on the question of the formation of a Joint Advisory Council. The three bodies represent an aggregate membership of nearly 1,400,000. A scheme has been drawn up for submission to the Unions, one provision of which is that, in the event of a strike by one body, the others will take action in support, and all national wage or other demands are, by interchange of views through the Advisory Council, to be presented simultaneously. This movement cannot be looked upon too seriously. Joint action by such a combination would mean the complete holding-up of the country; and everything would be paralyzed through the absolute stoppage of supplies and means of distribution. An alliance of this kind (if it comes about, as it assuredly will do sooner or later) will mean that, in time of industrial war initiated in any one of the three sections of the combination the other two must render support of some kind, and go to the extreme, if the object of the trouble has received the concurrence of the three Unions. Union is strength, and strength can be used in a manner to compel. The dockers have also approved a scheme for the amalgamation of the Transport Federation with the General Labourers' Council; and the shipwrights have, by a majority of a few hundred, agreed to joint action with the boiler makers regarding matters relating to wages and working conditions. These movements are significant. Labour appears to be looking further ahead than some people in the gas industry.

A Comic Investigation at the University of Padua.

With due solemnity and acceptance of the findings, the "Electrician" publishes the results of a series of investigations made, by Dr. E. Ronzani, of the University of Padua, to test the claims of the advocates of gas lighting regarding its hygienic superiority to electric lighting, in view of the assistance it renders, under ordinary conditions, in renewing the air of rooms, and in keeping the air in salutary motion. The Doctor's procedure in making his investigation was directly opposed to all the conditions that exist in an ordinary occupied room. In the first place, he built an air-tight box about 6½ feet high, 4 feet long, and 2 feet wide. To ensure that the conditions should be as foreign to a room as possible, the walls of this box were built of plate glass, with oak framing, puttied, and varnished, so that no air could get in or out, except through adjustable air admission and emission holes, at the will of the experimenter. During the chemical tests, the air inlet and outlet were kept closed. Such conditions are altogether the reverse of what is met with in ordinary rooms with their porous lath and plaster walls, plaster ceilings, windows, doors, and open chimneys. It is not scientific to carry out an investigation of this kind under conditions that abuse every condition that exists under normal circumstances. In this box the Doctor used a gas-burner, consuming no less than 5½ cubic feet of gas an hour! The more the details of the investigation are considered, the more one feels inclined to laugh at the absence of commonsense in connection with them. Is it an ordinary condition for a gas-burner using 5½ cubic feet of gas to be in use shut up in a box hermetically closed? An inverted gas-burner, using 5½ cubic feet of gas, and giving about 110-candle power, would suffice for a room of quite considerable cubical capacity. However, these were the circumstances under which the Padua Doctor tried to show that the claims of gas people are wrong *under conditions altogether contrary to the normal*. We will not say all we think about the performance.

Oxygen and Light and Life.

Out of this peculiar and ill-conditioned method of conducting the investigation, gas came out better than we should have anticipated. Take for example the oxygen experiments. What has Dr. Ronzani proved by them? That in this air-tight box the gas went out after it had consumed about half the oxygen, which would leave in the box about 10·5 per cent. We are surprised that the gas was not extinguished long before this. If he had said that the light was extinguished when the oxygen had fallen to (say) 16 per cent., we should not have contradicted him; and all the authorities show that it is only when oxygen is lowered below 14 to 15 per cent. of an atmosphere, that signs of oxygen-want arise in the case of human beings. Therefore, so long as a properly maintained incandescent gas-burner is giving a brilliant light, the occupants of the room in which it is situated have a sure index that there is more than sufficient oxygen about for their own needs. Does the worthy Dr. Ronzani know of any ordinary room where incandescent gas-burners have been extinguished through want of oxygen? Therefore where comes in the point and value of his absurd box experiments with a burner consuming 5½ cubic feet of gas per hour?

Playful Animals and Carbon Dioxide.

Even with the percentage of oxygen reduced to 10·5, playful rabbits and guinea pigs enjoyed life remarkably well in this hermetically sealed box; and after "three or four hours they experienced little discomfort even when there was insufficient oxygen to keep the gas alight." A strange thing is that, when the Doctor came to make his ventilation experiments, and had a small air inlet and outlet at, respectively, the bottom and top of the box, with consequently a change of air going on, rabbits and guinea pigs at the end of the first day had some difficulty in breathing; but the recuperative property of the gas-lighted box was such that the effect "diminished after one or two days." During this experiment, the air of the box contained about 10 per cent. of carbon dioxide. Has the Doctor ever come across a room ordinarily constructed and ordinarily lighted by modern incandescent gas-burners containing in its atmosphere as much as 10 per cent. of carbon dioxide? If not, what do his experiments go to prove—nothing but the absurdity of the experiments themselves. But an unfortunate thing about the results is that the animals which found difficulty of respiration in a partially ventilated box, and had the gratification of finding the trouble diminishing after being confined in the like atmosphere for a day or two, contradicted the experiences of the rabbits and guinea pigs which were introduced into the *air-tight* box with the oxygen reduced to 10·5 per cent., and which experienced very little discomfort during the three or four hours of their incarceration. It is useless proceeding with an examination of these experiments, as we have never, in all our experience, seen more absurdly abnormal work for the production of information as to what occurs under normal circumstances.

Tarred Roads and Eyesight.

The alarmists are always on the warpath. A correspondent of "Motor" has raised the question as to whether tar-cum-dust can do any damage to motorists' eyes. He asserts that a Manchester

party recently drove to the seaside; and through "tarred dust" there was eye trouble among the party—in fact, in one case the trouble was so serious that the sufferer had—not to have his eyes removed, but to stay away from business for "a day or two." First it was vegetation and then fish that suffered destruction through tarred roads; then came the fell risk of the dissemination of cancer by the use of tar; now it is eye trouble. The present Government ought to use their power and the Parliament Act for the passing of legislation for the suppression of cranks and fanatics. But one by one the terrible phantoms raised over tar are laid to rest; and the eye trouble one will no doubt find repose before long. A curious thing is that tar-spraying has been going on for years; and many thousands of miles have been covered over tarred roads by many thousands of people, but no one can trace any eye trouble that can be directly attributed to tar-surfacing. "Goggles" were invented before tar-surfacing came in; and "goggles" were introduced for the express purpose of defending the eyes from damage by dust, which was a very serious thing before the advent of tar-surfacing. The dust set up or aggravated throat and bronchial, as well as tuberculosis, troubles. Sir James Crichton-Browne informed us last autumn that flying dust also formed a carrier of the dread organism of tetanus, which ordinarily lives in the alimentary canal of the horse, and hence was to be found in soil, dirt, or dust containing horse manure. On the whole we think that, if we have to choose between the two or more evils, we will, with the little evidence there is of eye injury from the so-called "tarred" dust, put up with this. It will be better, in view of the available means of eye defence, than returning to the evils and the dangers of pre-road-tarring days.

The Gas Institution Meeting for 1915.

At the last meeting of the Southport Corporation Gas Committee it was resolved—"That the Institution of Gas Engineers be invited to hold their annual meeting at Southport in June, 1915." The proposal comes up for confirmation by the full Council to-day (Tuesday).

The "Initiative" Work of the Institution Council.

In last week's article on this subject the remark appeared: "Finally, there is an allusion to the National Gas Congress and Exhibition, the initial suggestion in connection with which was made, we believe we are right in saying, first to the Council as one means of celebrating the Institution Jubilee." It would have been more correct to have said "to Sir Corbet Woodall;" and, to make the historical record of the Exhibition complete, and to give honour where honour is due, the words "by Mr. Walter T. Dunn, the Secretary of the Institution," could have been added.

The Award of the Goffinon Prize.

Under the title of "A Gratifying Recognition," we recorded in the "JOURNAL" for the 19th ult., the presentation of the Goffinon Prize of the French Society for the Study of Profit-Sharing to Mr. Charles Carpenter, D.Sc. The number of the "Co-Partnership Journal" of the South Metropolitan Gas Company for the current month contains a frontispiece giving an illustration of the prize, and the following editorial remarks concerning it: "All co-partners will heartily appreciate the honour which the Chairman has received at the hands of French advocates of co-partnership. The gold medal, known as the Goffinon Prize, is a recognition of services rendered to the cause of co-partnership, not merely by our Company as pioneers, but by Mr. Carpenter personally, as associated with the scheme from its inception and as an enthusiastic advocate of its principles. That the recognition should come from the land of Leclaire and Godin is especially gratifying." The medal bears the effigy of the late M. Charles Robert, the biographer of Leclaire, who by his writings did much to direct attention to the work and ideals of "the father profit-sharing."

Pipe-Lines for Coal.—The "Ironmonger" says a novel method of transport for coal has been proposed in the United States, consisting of a pipe-line between Illinois and Chicago. The coal would be transported by water at a speed of 7 feet per second; delivering 60 tons per hour with a 15 per cent. mixture.

National Physical Laboratory.—The President of the Royal Society, as Chairman of the General Board of the National Physical Laboratory, will, with his colleagues on the Board, hold a reception at Bushy House, Teddington, on the 19th inst., when the series of departments and remarkable collections of scientific appliances will be open for inspection, under the guidance of Dr. R. T. Glazebrook, C.B., F.R.S., the Director, and the members of the staff. In the Electrotechnics Division, one of the interesting features to gas men will be the room for illustrating different methods of illumination, equipped for the Home Office Committee on Factory Lighting.

FUNERAL OF MR. THOMAS NEWBIGGING.

Manchester Honours a Distinguished Citizen.

THE characteristic feature of the funeral of Mr. Thomas Newbigging, D.Sc., M.Inst.C.E., who died on Whit Monday, at his residence, Woodgarth, Knutsford, in his 81st year, was absence of ostentation. Mr. Newbigging was well-beloved, not only in the circle of gas engineering, but in that of literature—this fact being emphasized by the presence of many distinguished members of the Manchester Literary Club and other kindred Associations. He was also Hon. Treasurer of the Manchester District Institution of Gas Engineers at the time of his decease. No formal invitations to the funeral had been issued; nevertheless, many men connected with science and industry assembled at the Manchester Crematorium on Thursday to do honour to one whose name has for years past been a household word in the gas industry. The late Mr. Newbigging was President of the Manchester District Institution of Gas Engineers in 1879; and the fact that his son, Mr. John Gibson Newbigging, M.Inst.C.E., Chief Engineer to the Manchester Corporation gas undertaking, is its President in the current year added poignant interest to the proceedings.

Notwithstanding that holidays were on in the Lancashire district, there was a representative attendance of engineers, some of whom, and the Associations they represented, were:

Institution of Gas Engineers: Mr. Edward Allen (Liverpool), the President; Mr. John Bond (Southport), the President-Elect.

Manchester District Institution of Gas Engineers: Mr. Edward A. Harman, M.Inst.C.E. (Huddersfield) and Mr. W. Whatmough (Heywood), Vice-Presidents; and the Honorary Secretary, Mr. G. S. Frith (Runcorn). Members of the Committee present were: Mr. John P. Leather (Burnley), Mr. J. W. Allin (Chorley), and Mr. S. E. Halliwell (Littleborough). Several Past-Presidents also attended, including Mr. H. Kendrick (Stretford) and Mr. T. Duxbury (Oldham).

Mr. W. W. Woodward (Salford) was present, as also were Mr. Robert Dempster (Manchester), Mr. W. A. Drake (Halifax) and Mr. T. S. Clapham (Keighley), who represented their firms and the Society of British Gas Industries, together with about a dozen representatives of the Manchester Literary Club. Mr. Joseph Hepworth (Edinburgh), Mr. Thomas Duxbury (Manchester), and Mr. R. J. H. Sayers (representing Mr. John West), honorary members of the Institution, were also observed among the mourners.

The English Junior Gas Associations were represented by Mr. A. L. Holton (Manchester); the Manchester Gas Committee, by Councillor William Kay, J.P. (Chairman); and the Manchester Gas Department, by Mr. Frederick A. Price (Superintendent).

Rev. G. A. Payne (Unitarian Minister at Knutsford, and a well-known member of the Manchester Literary Club) and Rev. F. H. Ballard (Congregational Minister, also of Knutsford) were the officiating clergy.

As the remains were carried into the crematorium, followed by the principal mourners—Mr. J. G. Newbigging and Mr. W. Newbigging (sons), Mr. T. F. Tattersall (son-in-law), and Mr. E. Hinmers—the members of the various deputations lined the walk leading to the entrance; the organist, Mr. J. Harold Sandiford (Altrincham) playing Chopin's Funeral March from the pianoforte sonata. The cremation casket was enveloped in a velvet purple pall, upon which there were two floral emblems from the family.

A COLLEAGUE'S EULOGY.

The Rev. G. A. Payne, in the course of a brief address, commenced by quoting Whittier's

> "On easy terms with law and fate,
> For what must be I calmly wait,
> And trust the path I cannot see.
> That God is good sufficeth me."

"These," said the preacher, "might well have been the words of Thomas Newbigging himself; for both he and the writer breathed the same spirit of loving trust in the Divine guidance." Each, he continued, was a lover of Nature in all her changing aspects. Mr. Newbigging had been taken from them in the Spring—the season when he felt that Man and Nature were in closer communion than at any other time—and there seemed a special appropriateness in this, when they reflected that he frequently wrote in prose and verse about the delights of the English Spring. He revelled in the beauties of Nature, and was not slow to discover that even "silence had a voice." To them his passing into the spirit world could bring no vain regrets. Those who knew him intimately, and valued him at his true worth, would be unable to help feeling a great sense of loneliness; and they prayed that God might whisper His messages of love and consolation to those who were bereaved. Whether the late Mr. Newbigging was near or dear to them, or whether they had come in order to show their respect and esteem for one who held a high place in their affections, all of them could unite in gratitude to God, for having given them for so long a life which had ever been active for truth and duty, and honour, and around which many sacred memories would continue to cling for many years to come. To a large number of societies and institutions—literary, scientific, and philanthropic—his death would be a great loss; but to no society, perhaps, more than to the Manchester Literary Club would the severance be felt in a distinctly personal way. The oldest member, Mr. Newbigging was also one of the most regular in attending the meetings, and one of the most popular at all social gatherings—contributing not only valuable papers on a variety of subjects,

but also witty and caustic criticisms which were always taken, as they were always given, without the faintest suggestion of malice. And just as the members enjoyed his presence among them, so nothing gave him greater pleasure than to be there. It seemed fitting, then, that they should offer a few words of affectionate farewell to one who did so much to brighten, and also to enlighten, his fellow members, leaving to more capable hands than his (the speaker's) the record of his life's work. Almost up to the last Mr. Newbigging continued to be in touch with men and things. His energy and buoyancy of spirits were remarkable for a man, old in years, but young in heart, who had throughout a long and strenuous life been a tremendous worker in many fields. As politician, scientist, author, poet, critic, essayist, he never lost that genial sense of humour which was as characteristic as his modesty. He loved his work, and he loved his leisure time; and nothing pleased him better than to be among his beloved books.

The preacher concluded with another quotation from Whittier:

> "God calls our dear ones, but we lose not wholly
> What He hath given;
> They live on earth, in thought and deed as truly
> As in His heaven."

After the committal service, the organist gave "O Rest in the Lord" (Elijah); and, at the conclusion of the service, "I know that my Redeemer liveth" (Messiah).

The incineration ceremony over, the ashes were enclosed in a silver-mounted casket, upon which was inscribed Mr. Newbigging's name, with his degree and diploma. The casket was afterwards interred in the family grave at Altrincham.

PERSONAL.

Mr. A. KIRKHAM, the Manager of the Tramore (co. Waterford) Gas-Works, has been appointed Manager of the Enniscorthy (co. Wexford) Gas-Works.

We learn from the current number of the "Journal des Usines à Gaz" that M. JOSEPH ALFRED ANCEL, Chairman of the Lyons Gas Company, has been nominated a Chevalier of the Order of the Legion of Honour. M. Ancel is an engineer by profession, and has seen sixty-three years of service. He was President of the Jury in Class 75 of the Ghent Exhibition last year.

At a meeting last Thursday of the Directors of the Sleaford Gas Company, Limited, Mr. HENRY WIMHURST was elected to a vacant seat on the Board caused by the death of Mr. A. Richdale. Mr. Wimhurst's position is now that of Engineer and Manager and Director. This is a well-deserved honour for his 38 years' faithful service with the Company, and is naturally regarded by Mr. Wimhurst as a very great compliment.

Many friends in the gas profession gathered together on Saturday, the 30th ult., at Eastbourne, at the marriage of Mr. HERBERT TAYLOR, who has charge of the show-rooms at the Wimbledon branch of the Wandsworth, Putney, and Wimbledon Gas Company. The bride was Miss HILDA GARRARD, second daughter of the Secretary of the Eastbourne Gas Company. The church was crowded with friends of the respective families; and the presents, which numbered nearly 200, testified to the esteem in which the young people were held.

OBITUARY.

The death has taken place of Mr. F. C. ANDREWS, who had been Chairman of the Bury St. Edmunds Gas Company for several years. He was formerly a member of the Town Council, and an Alderman of the borough.

Mr. THOMAS W. FRY (whose death was briefly referred to in this column last week) was for 38 years a Director of the Dover Gas Company, in the business of which he took great interest—in fact, on the last day he was able to be out, he visited the Company's exhibit at the County Rink. Mr. Fry was in business for many years as an auctioneer and surveyor, and was also at one time a member of the Corporation. He had been in failing health recently, but was not confined to his house till towards the end of April. He had attained the good old age of 81.

The death occurred on the evening of the 29th ult., after a brief illness, of Mr. F. C. ANDREWS, the Chairman of the Bury St. Edmunds Gas Company. Deceased had occupied this position for several years, and displayed keen interest in the affairs of the Company and of the town in which their operations are carried on. He was for about forty years one of the most active tradesmen in the borough; but he relinquished business several years ago. At one time he was a member of the Corporation, and in 1892 was elected an Alderman; but he retired in 1898. He was twice Mayor of the town—in 1887 and 1894—and discharged the duties of the office in a highly creditable manner. He had for some years been a Justice of the Peace, and was a regular attendant at the Courts of Petty Sessions. The interment took place at the Borough Cemetery last Tuesday, in the presence of many sympathizing relatives and friends. Mr. A. F. Young, the Engineer and Manager of the Gas Company, attended as one of the representatives of the undertaking. Deceased, who was in his seventy-sixth year, leaves three sons and four daughters.

ELECTRICITY SUPPLY MEMORANDA.

QUITE a little flutter it is seen has been made over the success of the "Bamag" Company in obtaining the Tottenham gasholder contract, possibly through "understandings" as to the minimum prices in this country. In the electrical industry, the handing over of heavy British contracts for generating plant to manufacturing firms of other countries has become so common a practice that little or no notice seems now to be taken of such an occurrence; and, what is more, the electrical manufacturers of this country do not appear to be in the position to gain anything like compensatory contracts from abroad. On the other hand, British gasholder builders do get an immense amount of the gasholder work that is going in other countries. One firm especially has done particularly well with gasholders in Southern Europe; and contracts have often been referred to in these columns that have been secured by our gasholder makers for Canada, South America, the Far East, and in the Colonies. There is a 12 million cubic feet holder for Sydney, the contract for which is in the hands of a British firm. These things show that our British holder builders can, if they choose, maintain their position in competition. Still, the trend of things in the electrical industry is not a palliating circumstance in connection with the non-success of the home firms over the Tottenham holder contract; and, in the interests of the gas industry and of the country, it is hoped there will not be any similar development to that which has occurred in the electrical industry in connection with holders and other gas plant. It is a pretty big wedge the thin end of which is represented by a 6¾ million feet holder.

Foreign Contractors for English Plant.

The Electrical Correspondent of "The Times" has had a little comment upon the Long Eaton judgment; and he accepts it as quite a commonsense interpretation of the law in regard to the subjects of the differentiation of prices and undue preference. He agrees that the proviso as to the like treatment of consumers under similar circumstances has been rather daringly interpreted by some central station managers; and he is certainly in agreement with Mr. Justice Sargant that "the limit" was overstepped when the Long Eaton Council differentiated in favour of power users who lighted their premises electrically by charging more for energy to those who drove their machinery by motors but retained gas-burners for lighting. "By all the canons and calculations of station management, the load factor of the second class of consumer is better for the station than that of the first. It has been common enough to charge less for lighting where current is consumed for power, but the converse proposition is untenable, as the Court has now pronounced." But Mr. Max J. E. Tilney, Assoc.M.Inst.E.E. —who ventured through the "Electrician" to indirectly tell a Judge of the High Court that he is absolutely at sea over this matter, and that Mr. Tilney is a better interpreter of the meaning of the sections in question in the Act of 1882—is obviously one of those electrical gentlemen who is rather in favour of the law accommodating itself to the conditions of the bargainings of electrical libertines, than that the conditions of bargaining should be becomingly maintained within the lines of the law. He has another turn at the subject in our contemporary, and gets himself into a bigger knot than ever. His last letter was intended to explain what was somewhat hazy in his former letter; and there is such evidence of a floundering about among the crudities of the layman's legal knowledge that he would have to write, if the "Electrician" encouraged him, another letter to explain points in the second one. He now says the whole point at issue is "simply whether the Act should be read in the light of present-day practice and knowledge, or whether it should be read in the light of what was 'common knowledge and practice' at the time of the passing of the Act. I am assured by lawyers that this is the usual way in which Acts are interpreted." How very simple! One thing Mr. Tilney was not told by the lawyers was that the Legislature has not seen any reason to abrogate sections 19 and 20 of the Act of 1882 under the changed circumstances of the electric supply industry. What was good law in 1882 may be equally good law in 1914, developments in circumstances notwithstanding. The undue preference at Long Eaton proves that it is. Mr. Tilney further writes:

Undue Preference.

> At the time of the framing of the sections in question, power supply was truly in its "infancy," and the whole conditions of supply have entirely altered in the interval. It might even be of interest to consider whether the question of different rates for lighting and power had ever been considered at that date; and in that case the judgment might have still more far-reaching results. It would, however, be a matter of some difficulty to decide this point, as there is reason to believe that these sections in their original form have been carried bodily from the first Act dealing with electricity supply.

These lines suggest stronger reasons why Mr. Tilney should refrain from further superficial splashings upon the troublous sea of legal intricacies and interpretation.

Domestic Half-Watts.

The Electrical Correspondent of "The Times" anticipates that there are likely to be a fair amount of electrical disturbances next lighting season through the commercial distribution of so-called half-watt lamps. He asserts that there is now

no difficulty in supplying such lamps in sizes suitable for domestic use, but thinks it is probable that the manufacturing trade will suit its own convenience by first dealing with the demand for public lighting. He advises station engineers to be prepared for a lower revenue per domestic lamp. To counter this, he suggests the extension of business to small cottage property under the "fixed price" system, and collectively to take publicity measures for encouraging a more lavish taste in illumination. At present, the low prices for power, heating, and what little is done in cooking, find support upon the existing charges for lighting; and without this support being maintained at its full strength, a diminution of the lighting revenue by something like one-half, is not, in many undertakings, a happy condition for the central station managers to contemplate in connection with their prospective fortunes. Whatever the efficiency of the lamps, there is much of the capital expenditure incurred in supplying lighting consumers that cannot be reduced. This also applies to the supplying of small property at fixed prices. Something, of course, might be gained by the fixed prices being maintained with the reduced current consumption of the new lamps. But the fitting-up of such houses cannot cost less than at present; and the charge will thus have at any rate to be maintained, seeing the uncomfortable experiences of some electrical undertakings in profitless business in speculative work among cottages. The fitting-up of such houses has been reduced to the extreme in the matter of quality; and the rules and regulations of expert framing have been ignored with an abandon that is truly remarkable. But the recent movement against transgressions in wiring work in view of the responsibility involved, may have some influence in producing greater care in future. We cannot, however, see much hope for the electrical industry in the direction of the supply of cottages, especially having in view the greater range of economy and conveniences offered to prepayment gas consumers—from lighting to cooking. As to creating a more lavish taste in illumination, public knowledge is already growing as to the ill-effects of high intrinsic brilliancy lamps; and it is not likely that where (say) 25-candle power lamps suffice to-day, consumers will go in for 50-candle power ones. In the case of cottagers under the fixed price system, they will no doubt be glad enough to be relieved of the "dim religious light" that is thought by electrical engineers to be good enough for them, and to have lamps of double the candle power. Then their consumption will not be less than at present. "The Times" Electrical Correspondent has not contributed much to the elucidation of the best methods of meeting the prospective difficulties of the electric supply industry, assuming that a dependable domestic (so-called) half-watt lamp is within reach.

The Present Position.

It is also as well to stop to inquire as to the actual position of domestic "half-watt" lamps. There does not appear to be any possibility, for physical reasons, of obtaining any such lamps that will work on the voltages common in this country; and to be compelled to use lamps in series (excepting for shop purposes, which in some districts is the main business done) will extinguish all advantage for domestic purposes. For domestic lighting, to have to use transformers will play sad havoc with the aspirations of the central station engineer to develop the use of electricity for purposes other than for lighting. In truth, the development in the electric lighting field is one of the worst enemies with which central station managers have to deal. However, with all the hard work in the laboratories of lamp makers nothing fresh has been produced for domestic purposes save what must be used in series or by the aid of transformers, and the transformer is not by any means contributive to the work of boosting-up domestic consumption, which threatens to become so much less by its use, while the capital expense between street cable and meter, and from meter to lamp, remains precisely the same. The latest information as to domestic half-watt lamps is to this effect: Small half-watt lamps have been introduced in Germany, used in conjunction with small step-down transformers, and these transformers are standardized in sizes of 10, 25, and 75 watts, with a secondary pressure of 14 volts, and for 450 and 750 watts with a secondary voltage of 60. The gain in efficiency of the lamp over that of the ordinary metal filament lamp is said to much more than compensates for the loss in the transformer. Regarding the interview with Herr Rathenau published in the "Berliner Tageblatt," and alluded to in the "Memoranda" for May 26, the "Elektrotechnische Zeitschrift" says that the 25-candle power and 50-candle power half-watt lamps referred to as shortly coming on the market are A.E.G. ("Nitra") lamps of low voltage, only suitable for use in series, or for supply through low-voltage transformers. In Germany these are being advertised in sizes down to 50-candle power. So far in this country little has been heard of the lamps, excepting through the news columns of the electrical press. What about the life of the misnamed "half-watt domestic lamps, in view of the difficulties found to arise between temperatures and filaments.

High Temperatures and Lamp Life.

There is a point concerning the life of these high-power "half-watt" lamps which occurs to one after reading an article that has recently appeared in the "Elektrotechnische Zeitschrift." It was by Herr Sunden; but it did not specifically treat of the new lamps, but of the currently used metallic filament lamps. It is known that some of the manufacturers and scientifically disposed illuminating engineers have urged, on account of the extraordinary intrinsic brilliancy of the new lamps, that eyes should be protected by the enclosure of the lamps in globes or screens of varied devising. This has the drawback, from the user's point of view, of diminishing the efficiency. The enclosure in globes, however, has the effect of so intensifying the temperature that special means have to be taken to ventilate the lamps, and so, with more or less good result, reduce the temperature. The question raised by Herr Sunden's article is, What effect has the increased temperature upon the life of the filaments? Does it or does it not reduce their resisting power? According to his experiments, it does. He states that, when metallic filament lamps first came into general use four years ago, it was noticed that lamps mounted in globes soon "seemed" to lose their brightness. He constructed a tube to ascertain what was the effect of increased temperature on the filaments. In the tubes lamps were placed until a steady temperature of 200° C. was attained inside the tube. In order to test the mechanical strength of the filaments, a shock apparatus was employed, the principle of which is to permit a rubber ball to come in contact with the lamp bulb after a run down an inclined plane; the length of the incline being a measure of the force of the impact. Lamps which resisted the impact of the ball sent down an incline 6 metres long were placed in the testing tube, and alight remained there until the temperature of 200° C. was attained. The result was that, at the end of forty hours, at 200° C., none of the lamps was found to be capable of withstanding any shock, while those in the open showed a much more gradual decrease in mechanical strength. It was also noticed that the lamps that had been run inside the tube were much blacker on the bulb. With a 300-candle power electric lamp in a globe, with reflector, the temperature reached in 35 minutes was 70° C. This was with clear glass. If the glass is obscured in any way, the rise in temperature is still higher; and the amount of light emitted is, of course, still smaller. The lesson of these tests is that to get the utmost economy—in respect of both life and light—from the lamps, they should not be enclosed in globes. There is the difficulty. If lamps must, through their high intrinsic brilliancy, be enclosed in protecting globes, and this enclosing is going to shorten their lives, users will not take kindly to them. Already we hear of experiences with the high-power forms of "half-watt" lamps which are not creating favour on their behalf in the eyes of at any rate some users, who have found the investment is not working out altogether as represented along the road of economy.

Methods of Popularizing.

The managers of electricity undertakings have come to the conclusion that one of the best ways of developing the use of current for purposes other than lighting is by giving facilities for some small use. One well-known firm of manufacturers in order to assist in this direction, give intimation to the effect that they have made arrangements whereby electricians and ironmongers can supply "Magnet" domestic irons for fifteen days' free trial where electric lighting is in vogue. Something in the nature of a monument to such a disinterested firm will no doubt be erected in the days to come. There is another firm that goes to work in a different way. Looking into its showroom window the other day, we saw a printed card informing the public what a unit of current costing a penny will do, or rather is asserted to do. We sometimes wonder whether such electrical people are really dupes of their own imaginings as they would have the public be. Among the statements on the card is that a unit of electricity will boil 16 pints of water. It is easy to calculate that given water starting cold at (say) 48° Fahr., to raise the 20 lbs. (or 16 pints) to 212° Fahr, electricity would have to exceed the theoretical limit to perform the work. There are no electrical appliances that have a heat efficiency of 100 per cent.; but the firm in question appears to assume that there are. Taking 16 pints of water at 50° Fahr., and raising it to 212° Fahr., the 3240 B.Th.U. of the unit of energy would at 100 per cent. efficiency work out absolutely correctly. This is all very nice. The statement may be swallowed by some people; but not by all. It is not said whether the boiling of the water is done on hot-plates or by kettles incorporating the heating element. If the former, 45 to 50 per cent. efficiency is claimed by some electricians; if the latter, not anything like 100 per cent. is realizable. Another statement is that a unit will run a cooking "range" for one hour. It depends upon the size of the "range" and the work to be performed. Information on both points is omitted. We have not yet met an electric range that will consent to be run for an hour on a unit of electricity—that is, if the "range" is worthy of the name, and has an accommodating hot-plate. A further statement is that the unit will warm a room for two hours. This represents half a unit per hour. Perhaps the firm in question is referring to the summer time, and not to the winter; or perhaps they are alluding to a box, and not to a room. We cannot tell. But the statement represents 500 watts per hour; a four-light radiator uses a unit per hour! Some electrical engineers who believe in economy say that not less than 1 watt per hour per cubic foot of room capacity must be used for warming; but the more cautious prescribe 1½ watts. Under the one allowance, the ½ unit would heat a room having only 500 cubic feet capacity; and under the other allowance, one having a capacity of only 333 cubic feet. What does a firm of the standing of a contracting one in St. Paul's Churchyard mean by exposing a card bearing such extravagant declarations?

SOCIÉTÉ TECHNIQUE DU GAZ EN FRANCE.

Papers for the Forthcoming Congress.

In the "JOURNAL" for the 28th of April, an indication was given of the nature of the programme provisionally prepared for the forthcoming congress of the Société Technique du Gaz en France, which will open in Paris to-morrow week, under the presidency of M. Auguste Boutan, the Managing-Director of the Lyons Gas Company. We are now in a position to give a list of the papers to be submitted to the members.

"The Storage of Coal under Water," by M. R. d'Estape.
"Tool for Removing Tar from Below the Dip-Pipes of Hydraulic Mains," by M. Becquart.
"Furnaces Consuming Gas Coke and Heavy Tar Oil for the Thermic Treatment of Metals," "Comburimetric Tests of Coal Gas," "The Best Height for Large Light Centres for Public Lighting," by M. Grebel.
"Analytical Study of the Principal Systems of Coke-Ovens: Their Stability and Economical Working," by M. Berthelot.
"Utilization of Methodical Vesicular Atomization in the Gas Industry—the 'Excelsior' Apparatus," "Appliance for Use in Making Branch Connections," by M. Bachelay.
"Centrifugal Tar Remover," "Volumetric Pressure Raiser," by M. Mazeron.
"Purification," by M. Guillet.
"Purification," "Improvements in Appliances for Heating by Gas—the Integral Radiator," by M. Lebel.
"The Means Employed at the Angers Gas-Works to Prevent Deposits of Naphthalene in Gas-Pipes," by the Works Engineers.
"Safety Arrangement for Gas-Meters," by the Compagnie des Compteurs.
"Conveyance of Gas to a Distance," by M. De la Boulaye.
"Slide-Rule for Solving Problems relating to the Flow of Gas in Mains," "Gas-Cooking Demonstrations in the Communal Schools for Young Girls in the Suburbs of Paris," by M. Masse.
"Application of Gas for the Distribution of Hot Water in Large Quantities," by M. Frère.
"Central Heating of Apartments with a Coke-Fired Boiler," by M. Gaunard.
"Central Heating with Hot Water on a Level and at Accelerated Speed by Illuminating Gas," by M. Grunberg.
"The 'Lampyris' Automatic Lighter and Extinguisher for Gas-Burners," by M. Mangiapan.
"High-Power Lighting by Gas or by the Half-Watt Lamp," by M. Bergner.

In addition to these communications, reports will be presented by the Committees on Professional Training, Manufacture, Distribution, and the Applications of Gas; and, as mentioned when noticing the meeting on the previous occasion, several interesting subjects, the titles of which were then given, will come up for discussion. The meeting will close on the 19th inst., and will be followed by an excursion to Lyons.

An Honour for Dr. A. H. Elliott.

The commemoration of the fiftieth anniversary of the founding of the American School of Mines was held towards the close of last month at the Columbia University, New York. From the programme of proceedings we learn that greetings from the Royal School of Mines in London were conveyed by Mr. T. A. Rickard, who delivered an address on "The Mining Engineer as a Pioneer." A number of honorary degrees were conferred on the occasion; Dr. Arthur H. Elliott, of New York, receiving that of M.Sc. of the class of 1881. Dr. Elliott is personally known to many of our readers, as he was present at the meeting of the Institution of Gas Engineers last year; and they will have an opportunity of renewing the acquaintance next week at Liverpool.

Liverpool and its Attractions.

In connection with the meeting next week of the Institution of Gas Engineers at Liverpool it will be of interest to note that the "Aquitania," the latest vessel of the Cunard line, will, it is expected, return from her maiden trip on Monday, June 15, and will be in the Gladstone Dock previous to sailing again on the 20th inst. This will form a distinct attraction. But a visit to Liverpool is incomplete without a ride on the Overhead Railway, from which a view of miles of fine docks, and ships that travel to all parts of the globe, can be obtained. Britain's largest vessels and the biggest "Dry Dock" in the world are seen to great advantage in this manner. The railway itself is interesting in many ways. It runs north and south, parallel with the Mersey, and was the first elevated railway in the world to be worked by electricity—having now been in operation more than twenty-one years, and has been visited by engineers from the United States, the Colonies, and all the principal European countries. Every summer thousands of people from the cotton centres of Lancashire, from Yorkshire, the Potteries, and the Midlands generally, ride along it "to see the docks," and many extend their journey to Southport, the "Garden City" of the north-west coast, which is reached by this and the Lancashire and Yorkshire Railway in about forty-five minutes.

WORKS TOPICS.

By "Modus Operandi."

Construction of Retort-Settings.

Having regard to the importance of well-designed retort-settings, it is extraordinary how little is published concerning them. When it is considered that to a large extent the results obtained depend on this very question, it would appear that some unaccountable factor is responsible. The men who are most experienced in the details of retort-settings are the specialists who are concerned with their design in the first place and their working in the second. The designer is sometimes the engineer, but is very often the contractor who builds the setting.

When we come to the working of the retort-setting, it is the works manager (in some cases the assistant) who knows most of this side of the question. In small works the manager is usually too harassed with all his multudinous duties to pay close attention either to the design, construction, or working of retort-settings. Here the contractor steps in, and makes himself responsible for much that a manager should have time to do himself. It is not the fault of the manager; the fault is on the side of the administrators who give him too much to do.

In large works it is usual to employ experienced engineers as works managers and assistants; and there is no doubt that the combined knowledge of these men and the contractor is often responsible for the construction of highly efficient settings. Some engineers prefer to do the whole of the work—both in design and in erection—with their own staff, and in exceptional cases with very satisfactory results. In other cases, however, this often leads to old-fashioned and stereotyped settings, which could be vastly improved by the trained mind of the works engineer or contractor, or, better still, by a combination of the two.

There is no doubt at all that the contractor can be a great help in the design of a setting. It is his business to be up-to-date in all that pertains to the construction of his particular speciality; and, to do him justice, he is usually found to be so. Accordingly, most engineers could with advantage avail themselves of the contractor's knowledge. To a very large extent they do, and with good results.

It is not only in the design that this system is an advantageous one, for it is impossible in all but large works to employ regular retort-setters—at any rate in sufficient numbers to cope with summer repairs and reconstruction. Temporary retort-setters (of a kind) may be engaged during the summer months; but their work, without the closest supervision, is often very bad. A contractor, on the other hand, has a large staff of regular retort-setters, and others who, though not permanently engaged, have been well-tried in the past in his employment. Added to this a contractor stands or falls on his reputation to do satisfactory work, which factor is, of course, very important in this connection.

Improvements in Retort-House Work.

The commencement of a new year is usually the signal for the preparation of plans for the summer reconstruction work. It is also the time when good resolutions are made for the coming winter. The writer would suggest that much good would result from the application of this principle to the question of retort-settings. It is not every engineer who is in a position to adopt vertical retorts just at present; so that for those who are limited to the improvement of horizontals, a good deal can be done by the introduction of approved methods of working, such as the following:

1. The use of high-quality retorts and bricks. First cost is not nearly so important a consideration as long life and satisfactory working. Besides labour costs in erection are no more, whether material be cheap or dear.
2. The use of "heavy" charges (ten or twelve hour) in horizontals, wherever possible. It is this alteration in working—if not already adopted—which will improve existing results all round by 10 per cent. or more.
3. The use of oval or oval ⌂ retorts of the strongest possible section with an easy radius at all points. Such retorts will last longer and make far more gas, during their lifetime, than a faulty shape of ⌂ retort.
4. The use of regenerators in all cases.
5. The use of furnaces with ample grate area—an important factor in saving fuel.
6. The use of large-sized producer openings.
7. The use of level hydraulics and tar towers.
8. The use of heat-insulation material for completely covering beds of retorts—another important factor in saving fuel.

One might continue such a list indefinitely; but the points mentioned above are important enough to be emphasized, for it is only by the introduction of such improvements that the results of horizontals can be made to compare with those of verticals.

There are engineers who find that retorts can be made to last for 2000 working days; but it is quite certain that such a lifetime is only possible in cases where the best material—and the best only—is used throughout the setting. In such cases every retort and every brick must be of top-quality, and every brick be suited to its particular position in the setting. In addition, the work must be done thoroughly well. Such perfection as this requires expert design and superior workmanship and supervision; but the result is worth any amount of painstaking trouble.

EVENT AND COMMENT.

[Communicated.]

Low Temperature Carbonization.

The recently issued prospectus of the British Isles Oil Producers, Limited, created considerable interest in technical circles; and in view of the strong criticism levelled at the proposals in certain quarters one might almost have expected the Directors, or those gentlemen who have given the reports referred to, to take cognizance of the criticisms. If, as they claim, their position is so strong, it should be a very simple matter for them to demonstrate it more clearly than is done in the prospectus, and also to convince technical critics as to the practicability of their proposals, both from the technical and the financial standpoint. The lead given by the British Isles Oil Producers has been quickly followed by a new development of the British Coalite Company—namely, the flotation of the Barnsley Smokeless Fuel Company, Limited, which is to erect a low-temperature carbonization plant in the Yorkshire coalfields. At the Waleswood Colliery, near Sheffield, there is also a low-temperature plant which has been in operation for some little time; but it is understood that this is only on an experimental scale. With regard to the "Coalite" proposals, the circumstances in this instance are certainly very favourable indeed; and if there is any prospect of success in front of the low-temperature proposals, it ought to be capable of realization in the present scheme. The new Company has ample facilities for the disposal of the bye-products, particularly of the surplus gas, tar, and benzol. The writer has seen it stated that the Company did not intend to produce a smokeless fuel, but that the intention was to gasify this fuel in producers working under recovery conditions, and so avoid the trouble of having to dispose of fuel in the open market.

In addition, gasification in producers gives them the advantage of having a much greater yield of ammonia. The main objection to this type of gasification has previously been that the quantity of gas so produced could not be satisfactorily disposed of. In the present instance, however, the Yorkshire Electric Power Company are prepared to take almost any quantity of gas; so that this objection does not hold good. The Power Company are also prepared to pay for the gas quite a reasonable price, based on its value for boiler-firing purposes.

In the particulars which appeared in the "Journal" last week, details were given of the various contracts which have been entered into for the disposal of the surplus gas and of the tar and the benzol. The writer has contended that there will be a difficulty in creating a market for any quantity of smokeless fuel at anything like the price which is generally put down for it in the balance-sheet of this Company. Those interested in the development of low-temperature carbonization have invariably made light of this point; and in the Old Silkstone proposals it says: "With regard to the excellent commercial smokeless fuel for which there is a ready sale for household and steam purposes;" and also in another place: "It will have a ready market for its smokeless fuel." It remains to be seen whether it will be quite such a simple matter to dispose of the smokeless fuel from 200 tons of coal per day as it is to dispose of that made in a plant having a capacity of only one or two tons per day, and only working intermittently.

The Utilization of Surplus Gas.

In connection with the disposal of the surplus gas produced on such plants as that being installed at the Old Silkstone Collieries, and also with modern bye-product coke-ovens, it is rather surprising to find that in most cases the gas is used for boiler-firing purposes. The value of gas so used, compared with coal, on a calorific value basis is only about 2d. per 1000 cubic feet of coke-oven gas delivered at the boilers, and with producer gas about ½d. per 1000 cubic feet. The same gas utilized in gas-engines, after making due allowance for cleaning, &c., is worth at least twice as much for the production of power. The old contention that large gas-engines are not reliable no longer holds good; for it has been proved beyond all doubt that these engines are now equally as reliable as steam-turbines, and when this is coupled with the fact that the hot exhaust from the engines can be used for steam-raising purposes, it will be seen that there must be tremendous loss of power through the utilization of gas for boiler-firing purposes. Of course, the question of capital cost must be considered; but if a balance-sheet is made out showing the capital required, maintenance, and working costs, as well as the value of the power produced over a period of (say) five years, it will be found that there is a considerable margin in favour of the gas-engine. In these circumstances, it is rather surprising to find that the Yorkshire Electric Power Company employ the gas in this uneconomical way.

The Coming of Synthetic Ammonia.

In some quarters there is a growing feeling that the present slump in the price of sulphate of ammonia is likely to continue for some considerable time. There is also a certain amount of uneasiness felt with regard to the ultimate effect of the competition of synthetic ammonia with that produced in the distillation of coal. The Haber process which has been taken up by a powerful German concern has now been brought to the stage when it is an assured commercial success. This process brings about the combination of nitrogen and hydrogen; and it is said that it can be worked at such a cheap rate, and with an unlimited and cheap supply of raw material, that as soon as sufficient plant has been erected, it will prove to be a very serious competitor to the present ammonia industry, and will indeed be able to control the market. There can be no doubt that this position will ultimately have to be faced, and that it behoves those who are interested in the production of sulphate of ammonia to spare no effort to assist the propaganda work which is carried out with the object of extending the use of sulphate of ammonia.

NOTES FROM ABROAD.

Berlin Gas Consumption.

A report having become current in Germany that the gas consumption in Berlin is receding, the last number of the "Journal für Gasbeleuchtung" refutes it with the following statement from the municipal gas authorities: There has been absolutely no question of a diminution in the gas consumption, though it is true that the 1913 increase was some 3 per cent. less than that of 1912. Even then the relative increase was as much as 4·1 per cent.

Meeting of Gas-Works Chemists.

In connection with the forthcoming meeting of the German Gas Association, a conference of gas-works chemists is also to be held at Munich—an experiment which was successfully tried a few years back. The probable dates will be July 6 to 8. It is intended especially to discuss the chemical problems of gas manufacture and consumption. From present inquiries it seems probable that there will be a large attendance of chemists.

American Natural Gas Association.

The Natural Gas Association of America held its annual meeting recently in St. Louis, and there was an attendance of some 600. Much attention was paid to the conservation of existing supplies of the commodity, and there were many advocates of an increase in its selling rate, owing to the decreasing supply and the expense of piping it from distant sources. Besides these topics, a paper was submitted on "Losses in Transportation," which should be of considerable interest, in view of the experience which the Americans have in long-distance gas distribution. It was decided to hold next year's meeting in Cincinnati.

American Views on the Calorific Standard.

The following extracts are quoted from "The Gas Age:" The first big victory of a calorific power standard over candle power occurred on April 29, when a British House of Lords Committee held a hearing on the Bill of the Gas Light and Coke Company, and decided in favour of the B.Th.U. standard. They fixed the calorific value at 540 B.Th.U. per cubic foot with a permissible variation of 7·5 per cent., making the minimum about 500 B.Th.U. . . . Of course the Company will hug the 500 B.Th.U. limit very closely, as it is near its present minimum, and consumers would get about 9000 B.Th.U. for a cent. At Boston we get 650 B.Th.U. gas for 80 cents, or 8100 B.Th.U. for a cent. The low price for London gas is less advantageous the more one thinks it over.

A Patronizing Approval.

When the conservative Britisher gives up the candle-power standard, its end is indeed in sight. We have, of course, made greater progress in this country in this matter of heat unit standard, but we have much yet to learn. The final consideration is not how low can we get the requirement without precipitating a riot, but rather how low can we get the price upon a gas that is the best for the appliances we use. There are many considerations against a poor quality of gas, whatever the price, and it would seem that a 600 B.Th.U. gas is better than one of 500 B.Th.U.—from a consumer's standpoint, at least. Where a lean gas can be used, as for heating in a steel-works, a producer gas has been found to answer the purpose very well. But, where the heat is localized, concentrated, or confined, a richer gas gives better results. High temperatures require a rich gas and oxygen to burn it, and thus the volume of the gases of combustion comes in as another consideration. It is well that heat value should be made the requirement for quality, but we should not strive at it so hard that we lean over backward in our efforts at uprightness. A satisfactory gas at a fair price is all any consumer asks.

The ninetieth meeting of the Waverley Association of Gas Managers will be held next Friday, at the Cathedral Hotel, Edinburgh, under the presidency of Mr. W. S. Easson, of Jedburgh. After the meeting—which includes an address by Mr. Easson and a discussion upon it, also "any other competent business"—the members will dine together and then inspect the Granton Gas-Works, on the invitation of Mr. A. Masterton, the Engineer.

Mr. Thomas A. Greene, formerly of No. 155, Cannon Street, E.C., an honorary member of the "Evening Star" Lodge, who died on Feb. 3, left personal estate of the value of £10,069. His will directed his trustees to procure the certificates of two duly-qualified medical men that death had really taken place, and they were to sever his carotid arteries so as to ensure that he was not buried alive. The will of the late Mr. Joseph G. Watkinson (principal of the firm of Messrs. J. & W. B. Smith) has been proved at £69,107 net personalty.

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GAS MEASURING AND RECORDING APPARATUS.

Meters on the "Venturi" Principle.—*For Illustrations, see next page.*

To anyone concerned with problems of fluid measurement, a visit to the extensive Luton works of Messrs. George Kent, Limited, could hardly fail to be of assistance. There are to be seen there, made, and in the making, meters and recorders for all purposes for which such apparatus is likely to be required—for dealing with gas, water, steam, and air. How varied are the types of instruments, may be inferred from the fact that the firm find it necessary to issue nearly a dozen sectional catalogues. An opportunity was afforded the writer last week of going over the works in the company of Mr. Leslie Kent, who explained, in as much detail as time permitted, the construction and *raison d'être* of numbers of these tell-tale appliances. Those designed for gas will be dealt with in a moment. As to water, there is the "Standard" meter for small flows, from a mere trickle to (say) a 3-inch pipe; the "Uniform," which is suitable for pipes of from 2 to 6 inches in diameter; and the "Venturi," which is adapted to any flow, except the very smallest. Even within the limits mentioned for the other two patterns, the "Venturi" is often used, because it can be fitted with a recording diagram, and not merely a counter. With reference to the "Venturi" tubes themselves, it may be mentioned that in the smaller sizes these are cast in solid gun-metal; while the larger ones are of cast-iron, with gun-metal linings. In passing, a word of praise must here be bestowed on the castings generally, which attain to a very high standard of excellence. The works are thoroughly equipped in every way for turning out the best class of goods; and all the parts for the firm's specialities are made on the premises. One set of apparatus a little out of the ordinary run which has just been completed is for South America, and has been designed for the purpose of notifying in the head engineer's office, as well as at the reservoirs themselves, the quantity of water contained in reservoirs hundreds of miles apart over the State; and in addition to the reading of the gauge, an alarm is automatically sounded when a reservoir is either nearly full or nearly empty.

The main object in view, however, when journeying to Luton, was to learn what progress has lately been made in the development of the "Venturi" principle as applied to the measurement of gas; and information as to this was gleaned in an interview with Mr. J. L. Hodgson, B.Sc., Assoc.M.Inst.C.E., the co-patentee with the firm. For some years now these meters have been used for gas; and Messrs. Kent have assurances that they are working well. As an example of a "Venturi" meter erected at a gas-works, the case of Bromley may be cited. This was the subject of a full descriptive article in the "Journal" for March 29, 1910 [p. 869]; and therefore it is unnecessary now to go into the matter from the beginning. Briefly, it may be remarked that the meters are claimed to combine the accuracy of the volume meter with the low cost of the fan meter; and they are designed for the measurement of gas of all kinds—coal gas, water gas, or blast furnace gas—and under any pressure or any condition. One of the great points about them, too, is that they have no mechanism whatever in contact with the gas flowing in the pipe-line into which they are fitted. They are, of course, based on a differential pressure system—depending for their accuracy on an extensive series of calibration experiments, carried out with the utmost care and at great expense. The meters have two parts—the "Venturi" tube and the recorder or indicator—and they are made in two forms. In one type arrangements are included for correcting for density (an important matter, particularly where varying percentages of coal gas and water gas are sent out); and in the other type there is no such provision. In the first place, the principle was applied to the measurement of air; but afterwards it was found that it could be adapted to gas. The problem of measuring gas is, however, much more difficult than that relating to air, because the latter is of constant density, whereas, as already remarked, gas is variable, depending upon the quality of the make.

"Venturi" Station-Meters.

The first gas-meters constructed by the firm were similar to the air-meters, in that they did not correct for density; and several of these installed at Sydney have, we learn, given every satisfaction. In the later type, the meter is automatically density corrected; so that, as stated in a paragraph in our pages last week, the results given are precisely similar to those of an ordinary station meter. It was pointed out then that the meter is entirely unlike the one put up at Bromley, but that it works on identical lines with one which has been in use at the Luton Gas-Works for the past year. These meters have a range of registration from full load down to one-thirtieth of full load. The ordinary station meter, of course, has a range right down to the lowest possible flow; but it is remarked that in actual practice it is not required to measure excessively small flows, except perhaps to trace leakages, and for purposes of that kind, so that there is really no disadvantage in not being able to do so.

Correcting for Density.

The action of the density-corrected station-meter (which has been named the "Hodgson" gas-meter) is as follows: The gas in flowing through the "Venturi" tube causes a fall in pressure between the upstream and the throat. This difference of pressure, which bears an exact relation to the rate of the flow, moves a differential bell-float in the same way that an ordinary gasholder is moved up and down by the gas. The bell-float is conical in vertical section, so that its movement is approximately proportional to the velocity of the gas; and in rising and falling it rotates a shaped cam by means of a rack and suitable gear-wheels. This cam is known as the "Venturi Head" cam; and its position is a measure of the rate of flow.

The automatic correction for variation in density of the gas is accomplished in this manner: A small quantity of gas is taken from the main, and passed through a wet meter mounted on a platform above the bell-float chamber. The gas then passes through a small orifice and an extremely sensitive regulating valve, after which it is discharged to atmosphere and burnt. The function of the regulating valve is to keep an absolutely constant head across this orifice. Under these conditions, the speed of the wet meter varies with the density of the gas. The axle of the wet meter is geared through a pawl gear to the driving-spindle of the counter. The pawl engages with the driving-wheel on the counter-spindle at one fixed point; but it is thrown out of gear earlier or later according to the position of a small striker, which is moved by the "Venturi Head" cam, which is actuated by the bell-float. It will be seen that the time during which the wet meter is driving the counter will vary according to the amount of the "Venturi Head;" while the speed at which the counter is driven will depend entirely upon the speed of the wet gas-meter. The registration on the counter, therefore, takes into account both "Venturi Head" and density, and gives the actual number of cubic feet of gas that have passed. The readings can be reduced to standard pressure and temperature by the usual tables. The gas passing through the wet meter is a negligible amount—about 500 cubic feet a week.

As to the evolution of the density-corrected meter, it may be explained that one of the former type of meters was put in at the Luton Gas-Works in series with the station-meter; and it was found that at times when the density of the gas was liable to vary, there was an error of 4 or 5 per cent. where no correction was made for variation in quality. The arrangement for enabling this correction to be made—or rather, to make itself—was therefore added. Since towards the end of last year the two meters have been running together, with an accuracy of within 1 per cent., which the firm regard as a highly encouraging result, considering that both meters might have some inaccuracy.

District Meters.

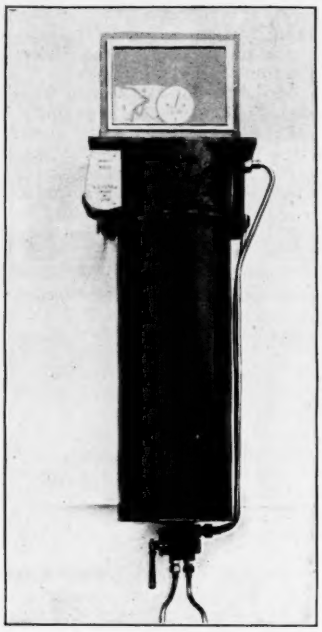
A smaller form of meter is made by the firm for putting on mains, so as to be used as district meters. They have a range of registration from full load down to one-eighth of full load, and register on a counter or by diagram. The same meter does for all sizes of mains; and it is thought it will be useful (say) where gas is being boosted to another part of a district and it is desired to see just how much gas is being sent out, so as to know when the holders at the other end of the main are full. They are also suitable for furnace work.

They are non-density corrected meters; and, as in the case of all the meters, the integration is effected by a "feeler," which comes down on to a cam whose position is set by the bell, which is controlled by the rate of flow. If the cam is moved to a big angle, the "feeler" moves to a correspondingly big angle, and adds on the proper amount to the counter. The difference between the two types is that in the non-density corrected meters the "feeler," which is driven by clockwork, comes down at equal intervals of time, whereas, as already explained, where there is automatic correction for density the intervals of time at which the "feeler" descends are so spaced that any variation in density is allowed for—this being accomplished by driving the "feeler" from the wet gas-meter.

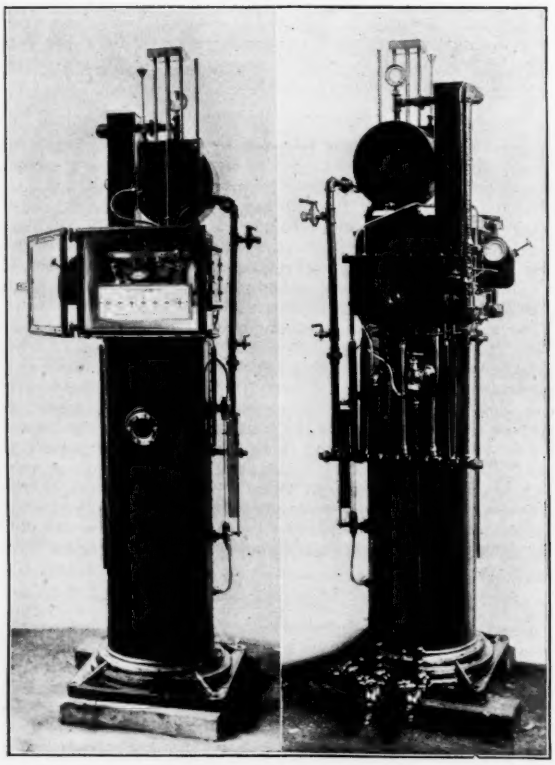
Advantages of the System.

A point on which emphasis was laid in the interview was the balance of advantage that is to be gained by the use of the system; for, after all, it is on this that everything else rests. The first of the favourable features to be pointed out will be evident from a glance at the accompanying photographs—the much greater cheapness of installation in the big sizes, owing to the very much smaller space occupied. The whole of the mechanism can be checked *in situ*. The firm calibrate the "Venturi" tube at their works, and the co-efficient of the "Venturi" tube is always practically unity, so that it can be taken that, provided the tube is clean, it is giving a certain discharge which depends only upon its size. If, therefore, it is known that the tube is clean, all that it is necessary to do is to put on a certain head, and see that the recorder registers the right quantity for this head. At the same time, each individual part of the instrument can be checked, without sending anything back to the makers' works. The latest patterns are being so fitted that both a counter and a diagram can be used on the same instrument. Then, to increase the capacity of the meter, all that is necessary is to fit a new "Venturi" tube—the same recorder does. Some few years ago, the firm put in about thirty of their "Venturi" air-meters on the Rand; and already nearly every one of them has had its capacity doubled by

the furnishing of a new tube. There is no limit to the size that can be employed; and the recorder can be placed at any reasonable distance from the tube. The "Venturi" tube itself, too, can be in any position, so long as there is a straight piece upstream of it of at least ten diameters. It is said that about a three-monthly inspection of the apparatus, taking perhaps half-an-hour, is all that is necessary to ensure that everything is in order.



The "Venturi" District Meter.



Front and Back Views of a "Venturi" Station Meter having Automatic Density Correction.

On one point Messrs. Kent are anxious that engineers should be warned, and this is that the meter is unsuitable for measuring very dirty gas; for it will be understood that such gas must have the effect of obstructing the "Venturi" tube. At the same time, if the gas is not quite clean there is a removable throat which can be cleaned in a few minutes. The prevention of deposition of naphthalene or tar can, however, be brought about, if found desirable, by the use of a steam-coil under the throat, to keep it warm. All the delicate parts being right away in a glass case which is absolutely dust tight, it is impossible for them to get dirty at all.

A Curved Tube Manometer.

Another instrument to which attention was drawn was a curved tube manometer. The object of this is to permit the accurate measurement of very small variations in head, so that it is particularly useful in connection with those meters where only a trifling differential pressure is employed. The fluid rises in a tube which is bent to such a curve that the scale is equal-spaced to read velocity or quantity.

The Station-Meter Counter.

The "Venturi" principle as applied to gas-meters is already well known; and the improvements which Messrs. Kent, Limited, are now introducing should have the effect of making it even better known in the future.

COAL GAS AND PETROL GAS: A COMPARISON.

By E. Scott-Snell, A.I.A.E., A.M.S.E.

In making a comparison between any two illuminants in the matter of the cost of the light derived from them, great difficulty is experienced. The efficiency of each rival has to be assumed; and this is a factor over which diversity of opinion is bound to exist, for each side considers that the opponent is rating the value to be obtained from his commodity at too low a figure.

The enormous difference in the amount of light possible from any illuminating agent is nowhere better exemplified than in the case of coal gas. A cubic foot of this fuel is capable of giving 1·8 to 2·9 candle-power-hours with luminous flame burners, from 11 to 30 candle-power-hours with low pressure incandescent gas systems, and from 30 to 60 candle-power-hours when incandescent mantles are employed on a high-pressure main. In a large town all these systems will be found in use simultaneously; so that the most efficient means of utilizing the gas will be giving about thirty times the value for money expended which is given by the least efficient. Not only does the efficiency vary over this large range, but in different parts of the country the price of the gas itself varies between such extremes as 1s. 6d. and 6s. per 1000 cubic feet.

If the price of 1000 candle-power-hours be taken as a basis of comparison, the extraordinary difference in the possibilities makes more definite information essential, and the price of gas alone is too meagre to be of very much value. In the case of petrol gas, one is very much handicapped by the lack of any authoritative statements as to photometrical results which may be depended upon. Moreover, the price of the fuel, although not varying very much in different parts of the country, fluctuates a considerable amount, according to the whims of the trusts that unfortunately control the petroleum spirit market. In view of the distressing lack of definite figures, the writer will endeavour to examine the possibilities of petrol gas in order to come to some conclusions as to what results should be expected if analogy is admitted as a legitimate form of argument.

When the two fuels are examined as regards their use for heating purposes only, a simple and direct comparison is all that is necessary, since the temperature of combustion does not enter into the calculations. The present price of the South Metropolitan Company's gas is 2s. 2d. per 1000 cubic feet; and the average calorific value for the year 1913 was 160 calories (635 B.Th.U.) gross per cubic foot. Since one gallon of 6·80 specific gravity petrol contains 20,000 × 6·80 = 136,000 B.Th.U. (gross), in order that the same value may be received for money in the two cases, the petrol from which the petrol gas was generated would have to be obtainable at the small sum of $\frac{2s.\ 2d. \times 136{,}000}{635{,}000}$ d., or about 5½d. per gallon; whereas at present it is about 1s. 10d. net. The lighting value to be obtained from the petrol gas is, however, not simply a matter of B.Th.U.; and comparison is a more complex matter, as I will proceed to show.

The use of petrol gas in flat-flame burners is quite out of the question, for technical reasons, and need not therefore be considered. Illumination by means of the mantle is consequently the object of our attention. The light given out by a mantle depends entirely upon the temperature to which the fabric can be raised; and the most important factor governing this, although not the only one, is, of course, the temperature of combustion of the gas. If we have before us the chemical analysis of any particular make of gas, we can form our conclusions by calculation of the highest temperature which can be obtained; and although such a figure may not be accurate, it is comparable with that found in the same way for any other fuel.

In the "Engineer's Year Book" we find one or two samples of coal gas from different parts of the country; and for the purpose of this article I have taken one of these analyses at random. I am not sufficiently experienced in coal-gas manufacture to say whether or not it is truly representative; but judging from its calorific value I should imagine it is a fairly good sample. Since the calculations involved are rather lengthy I give them separately in an appendix, and shall refer at the present juncture only to the results obtained.

When the correct units are chosen, the temperature of combustion of a fuel may be expressed in the form of an equation

$$T = \frac{\text{total heat evolved (net)}}{\text{weight of products} \times \text{specific heat}}$$

The only difficulty in the way of finding the temperature of the combustion with exactitude is that the specific heat of the products of combustion is not accurately known. It is apparently a function of the temperature, and different results are given by different authorities. The figures are known, however, for the specific heats of various gases at ordinary temperatures; and if we use these figures, we shall get a "nominal" temperature which will do sufficiently well for our present purpose, which is one of comparison only.

The sample of gas taken from the "Engineer's Year Book" comes from Manchester, and is made up as follows; the figures expressing the volumes per cent. of the ingredients.

H	42·90
CH_4	30·93
CO	14·99
Heavy hydrocarbons	6·80
CO_2	2·14
N	2·24

According to the same authority, it has the lower calorific value of 578 B.Th.U. per cubic foot. In the appended calculations the weights of the products of combustion have been reckoned out and the "nominal" temperature ascertained to be 4560° Fahr. If hexane, having a lower calorific value of 18,600 B.Th.U. per pound, is taken as typical of the petrol used for lighting purposes, the same process of reasoning gives a "nominal" temperature of 4365° Fahr.

Now one of the reasons why this temperature can only be regarded as nominal is that at high temperatures of combustion not only does the specific heat increase rapidly, but partial dissociation is supposed to take place, and by so doing to reduce the possible temperature by re-absorbing a portion of the heat generated by the combustion—the higher the indicated temperature the greater the degree of disssociation which may be expected. Obviously, then, the gas one would expect to give the higher temperature is handicapped a larger amount than its less energetic rival.

The calculations show that, theoretically, there is not much difference in the temperatures of combustion of coal gas and petrol gas when both are completely burned under ideal circumstances; and taking the foregoing limitations into consideration, it is probable that this difference almost disappears, or at any rate is too small to be of any practical value.

Having, I hope, established the point that under the best conditions the temperatures of combustion of the two illuminants are about the same, it remains to consider the governing factors in the attainment of the highest temperature in each case. There is little doubt that the highest temperature is only possible when the mixtures are as near as possible of the correct proportions, and that these mixtures must be delivered to the burner points at a critical velocity, which I see no reason to suppose would be different in one case to the other.

Now the injector effect of a bunsen burner may be shown by the equation expressing the conservation of momenta; so that if M lbs. of air is injected by 1 lb. of gas, and the mixture achieves a resultant velocity of V feet per second, then if v is the velocity of efflux of the gas from the nipple

$$v = (1 + M)\,V$$

Since the velocity of efflux from any orifice is proportional to $\sqrt{\frac{H}{D}}$, where H = pressure in inches of water column and D = the density of the gas in pounds per cubic foot, the impact equation becomes

$$\sqrt{\frac{H}{D}} = \text{a constant} \times (1 + M)\,V$$

$$\text{or} \quad H \propto D\,(1 + M)^2\,V^2$$

If it may be assumed that the ideal velocity at the burner point is the same in the case of petrol gas as coal gas (a perfectly reasonable assumption), then the relation of the pressures of the two gases necessary to produce the same effect—*i.e.*, ideal mixture (differing for each gas) at a certain ideal velocity (assumed the same for each gas)—will be

$$\frac{H\ \text{(coal gas)}}{H\ \text{(petrol gas)}} = \frac{0{\cdot}374}{0{\cdot}09} \times \left(\frac{1 + 11{\cdot}95}{1 + 1{\cdot}6}\right)^2 = 10{\cdot}3$$

where the figures for D and M in each case are taken from the appended calculations.

It was found that with a rich mixture petrol gas a pressure of only 2 inches is sufficient to give the same efficiency per B.Th.U. as 2 × 10·3, or over 20 inches of coal gas; and it should only need a rise in pressure to 7 or 8 inches to give equivalent results—of course, in properly-designed burners—to the extremely high pressures used in modern street lighting. In other words, ordinary petrol gas is the equivalent as regards intrinsic brilliancy of moderately high-pressure coal gas.

I was severely criticized for making a similar statement in a paper I read some time ago; but it is to be proved by simple mathematical reasoning, which is substantiated when the brightness of a bijou mantle fed by petrol gas and a similar mantle fed by low-pressure coal gas is compared, even without the aid of a photometer.

The foregoing analysis affords a comparison between the two gases only as regards their lighting efficiencies per B.Th.U. expended, and in no way considers the more important comparison as regards the cost of the light. In the absence of reliable photometrical data relating to petrol gas, however, basing arguments on the previous contention that low-pressure petrol gas is the equivalent in efficiency of moderately high-pressure coal gas, we can arrive at a fairly definite conclusion. Most gas engineers will allow that it should be possible, without having to resort to extremely high pressures, to obtain 40 candles per cubic foot with the gas under discussion (lower calorific value, 578 B.Th.U. per cubic foot). This means that every candle-power-hour requires the expenditure of $\frac{578}{40} = 14{\cdot}45$ B.Th.U. Petrol gas may be expected to give a similar result.

A gallon of light spirit may cost 1s. 10d. net; and if its specific gravity is ·680, it will supply 6·8 × 18,600 = 126,480 B.Th.U., which, arguing by analogy, should produce $\frac{126{,}480}{14{\cdot}45} = 8760$ candle power. The price of 1000 candle-power-hours should therefore work out at $\frac{1s.\ 10d. \times 1000}{8760} = 2{\cdot}5d.$ If ordinary motor-car petrol were used, say "Shell II." at 1s. 4d. net per gallon, the price per 1000 candle-power-hours would be reduced to 1·83d. In my opinion, however, the use of heavy spirit is objectionable for many reasons which need not be gone into here. Some time ago, Mr. Strode issued a report of photometrical tests with petrol gas on light spirit, which worked out as giving an efficiency of 9350 candle-power-hours per gallon, or, at the present price of the petrol, at 2·35d. per 1000 candle-power-hours, which shows that the reasoning employed in this article is quite legitimate, and the analogy with coal gas reasonable.

It is interesting to examine an analogy with the highest results that have yet been achieved. Assuming the record efficiency with coal gas to be that observed by Mr. Herring, where a Keith lamp running on 560 B.Th.U. coal gas at 61 inches gave 73 candles per cubic foot, this works out at 7·67 B.Th.U. per candle power; and on this basis of efficiency petrol gas made from "Shell II." should produce 1000 candle-power-hours for 0·916d., which is the same value for money as coal gas at 1s. 11d. per 1000 cubic feet, giving 25 candles per foot, or at 3s., giving 39 candles per foot. The pressure necessary with petrol gas to produce these results would appear to be $\frac{61''}{10{\cdot}29}$, or about 6 inches of water column. Such results, however, are not to be expected in ordinary conditions; and the first-mentioned figure of 2½d. per 1000 candle-power-hours is probably fairly accurate for the average installation.

It is obvious then that, although the efficiency of the petrol-gas mantle is a great deal higher than that obtained with high-pressure coal gas, when it comes to a question of costs, even when interest on capital and depreciation are neglected, competition with coal gas is very problematical, excepting in districts where the latter is about 4s. per 1000 cubic feet, and not very good at that; for if an efficiency of only 20 candle-power-feet is given, the price of 1000 candle-power-hours is just over 2·5d. A few years ago, when petrol was about half the price it is now, it was a different matter; but under present conditions, unless extraordinary advances are made in burners, competition with coal gas is best left severely alone.

The aspect of petrol gas in its relation to coal gas is the only one it is desired to consider in the present article; but it might not be out of place to point out that, although 2½d. per 1000 candle-power-hours is a high price to pay in towns where moderate priced coal gas is available, directly one gets outside the radius of the town mains it becomes an exceedingly low one. This will be seen at once when it is pointed out that with carbide at £13 10s. per ton, yielding 4·5 cubic feet of acetylene per pound and giving a duty of 48 candles per foot, 1000 candle-power-hours costs 6·7d.

Figures for the cost of a private electric lighting plant are extremely difficult to obtain, owing to the fact that depreciation and wages usually swamp the fuel charges, and cannot be neglected as in the case of small petrol and acetylene plants. There is every probability, however, that petrol gas will continue to hold its own

for country house work, even at the present high price of the fuel. But for town work, unless the oil trusts see fit to mend their ways to a most unlikely degree, the probability is that it will never secure any appreciable position.

The foregoing article purposely deals only with the price of light deduced from the price of the fuels on the spot, and takes no account of depreciation, interest on capital, and maintenance. The cost of the light is the main consideration, and the one about which the greatest doubt exists. I have therefore considered this factor only; leaving the question of the addition of standing charges to the gas engineer who wishes to make a comparison in any particular case.

Calculations re 578 B.Th.U. Coal Gas.

Analysis given in "Engineer's Year-Book" (1914), p. 1250.

Density and Air required for Combustion.

Constituent	Cu. Ft.	×	Density in Lbs. per Cu. Ft.	= Lbs.	× Lbs. Air required = Total Air per Lb. of Fuel Required.
H	42·9	×	·00559	= ·240	× 34·8 = 8·352
CH_4	30·93	×	·04472	= 1·384	× 17·4 = 24·081
CO	14·99	×	·07826	= 1·173	× 2·484 = 4·297
C_2H_4	6·8	×	·07826	= ·532	× 14·914 = 7·935
CO_2	2·14	×	·12298	= ·263	
N	2·24	×	·07845	= ·176	
Totals .	100 cu. ft weighs .			3·738 lbs.	and requires 44·665 lbs. of air.

Hence density of gas is ·03738 lbs. per cubic foot, and air required for complete combustion is $\frac{44·665}{3\ 738}$ = 11·95 lbs. per lb. of gas.

Products of Combustion.

Lbs. Constituent.		Lbs.	H_2O.	Lbs.	CO_2.	Lbs.	N.
H	·240	× 9	= 2·160			× 26·8 =	6·432
CH_4	1·384	× 2·25	= 3·114	× 2·75	= 3·806	× 13·4 =	18·546
CO	1·173			× 1·571	= 1·843	× 1·913 =	2·244
C_2H_4	·532	× 1·285	= ·684	× 3·143	= 1·672	× 11·486 =	6·111
CO_2	·263				·263		
N	·176						·176
		lbs. (100 c. ft.)					33·509
Totals .	3·738	give . .	5·958 lbs. H_2O.,	7·584	lbs. CO_2,	lbs. N.	

Nominal Temperature of Combustion.

Lbs. Products per 100 Cubic Feet.		Specific Heat at Low Temperatures.	Thermal Capacity per Degree Fahr.
H_2O	5·958	× ·479	= 2·854
CO_2	7·504	× ·216	= 1·638
N	33·509	× ·244	= 8·176
			Total 12·668 B.Th.U.

$$\text{Temperature} = \frac{\text{total heat evolved (net)}}{\text{thermal capacity of products}} = \frac{57,800}{12·668} = 4560° \text{ Fahr.}$$

Calculations re 6 per Cent. Petrol Gas.

Taking lower heating value of hexane (C_6H_{14}), 18,600 B.Th.U. per lb., and vapour density 0·239 lb. per cubic foot, as typical of petrol.

Density and Air Required for Combustion.

We have—

100 cu. ft. of gas = 6 cu. ft. vapour + 94 cu. ft. air.
= 6 × 0·239 lb. vapour + 94 × 0·0807 lb. air.
= 1·434 lbs. vapour + 7·58 lbs. air.
= 9·01 lbs. mixture.

Hence density of gas is $\frac{9·01}{100}$ = 0·0901 lb. per cubic foot, and every pound of vapour is mixed with $\frac{7·58}{1·434}$ = 5·29 lbs. of air to form $\frac{9·01}{1·434}$ = 6·28 lbs. of gas.

Now every pound of hexane requires 15·38 lbs. of air for complete combustion. Hence extra air must be added to the extent of 15·38 − 5·29 = 10·09 lbs. for every 6·28 lbs. of gas burnt—*i.e.*, every pound of gas requires $\frac{10·09}{6·28}$ = 1·605 lbs. of air to be added.

Products of Combustion.

1 Lb. of Hexane Gives as Products.		Specific Heat at Low Temperatures.	Thermal Capacity per Degree Fahr.
H_2O	1·467 lbs.	× ·479	= ·7047
CO_2	3·069 lbs.	× ·216	= ·6629
N	11·825 lbs.	× ·244	= 2·8853
			Total 4·2529

$$\text{Temperature} = \frac{\text{total heat evolved (net)}}{\text{thermal capacity of products}} = \frac{18,600}{4·2529} = 4365° \text{ Fahr.}$$

THE RELATION BETWEEN TEMPERATURE AND SPECIFIC GRAVITY OF ROAD TARS.

By M. Angelo.

The report of the Road Board, published early in the year [Waterlow and Sons, Limited], gives general directions and specifications relating to the tar treatment of roads.

In specification No. 1 it states that—"Surveyors are recommended to have samples of the tar supplied to them under contracts properly tested by a qualified analytical chemist for: (1) Specific gravity, (2) freedom from water, (3) fractionation, (4) free carbon." As this short paper is concerned only with the question of specific gravity determination, it will not be necessary to consider the other factors here. A specific gravity of 1190 is specially recommended for tar No. 1 and 1121 for tar No. 2; but ranges of 1160 to 1220 and 1190 to 1240 respectively are considered quite suitable.

Quoting from the report again, "the specific gravity may be ascertained quickly and with a sufficient degree of accuracy by means of a hydrometer, to the readings of which a correction for deviation from the standard temperature of 15° C. or 59° Fahr. is applied." Coal tar is notoriously a bad conductor of heat; and it is certainly a lengthy operation to adjust the temperature of the sample to the standard—in fact, it is often well-nigh impossible to do so in mid-summer weather when the business is in full swing.

The Road Board, realizing this point, advocate the use of a correction factor; and it becomes necessary to make two observations—the hydrometer and the thermometer. The correction factor used will depend upon the coefficient of expansion of the tar and also of the hydrometer itself; and as the physical constants of tars vary according to the plant and fuel from which they may have been produced, it is not good enough to use *any* factor. Hydrometers, being made to indicate the correct figure at standard temperature, are not necessarily correct at other temperatures; and since the coefficients of glass, brass, and german silver are all different, slight discrepancies may occur when hydrometers of such material are used.

The writer therefore advocates the experimental determination of such correction factor, so that the instrument may be standardized once and for all. There is no doubt that the manufacturer or surveyor can by this means obviate future trouble and save much time. It frequently happens that many samples have to be examined during a season; and a test should be worked through and the results charted for reference in such a case.

A carefully selected type sample of the tar should be heated and transferred to the tin ready for testing. Thermometer and hydrometer readings can then be taken in the usual way, and the results tabulated. The sample may then be allowed to cool somewhat while being well stirred, and a fresh set of readings taken. This operation should be repeated at any convenient intervals—of, say, 10° or 20°—until a fair range of temperature has been recorded. It is rather important that a careful reading be taken at the standard temperature, and preferably also as much lower as can be conveniently obtained.

The series of results may be recorded in tabular form or, preferably, and most conveniently, preserved graphically.

In the following table are given some actual results obtained as above indicated.

Thermometer Reading.		Hydrometer Reading.	Addition Factor to Correct to Standard.	Correction Factor for each Degree above Standard.	
° C.	° Fahr.			° C.	° Fahr.
7·2	45	1207	− 7	−·90	−·50
15·0	**59**	**1200**	**∓ 0**	**0**	**0**
26·6	80	1190	+10	+·90	+·50
35·5	96	1182	+18	+·89	+·50
48·9	120	1170	+30	+·88	+·49
58·8	138	1163	+37	+·86	+·47
71·1	160	1154	+46	+·82	+·45
82·2	180	1146	+54	+·81	+·45
93 3	200	1138	+62	+·80	+·44

Its use is simple. Suppose, for instance, a tar tests 1180 at 122° Fahr. The nearest temperature recorded is 120° Fahr.; and the correction for each degree above 59° Fahr. is therefore + 0·49.

The corrected gravity is—

1180 + 0·49 (122 − 59) = 1180 + (0·49 × 63) = 1211.

Again, a test is 1149 at 85° C.

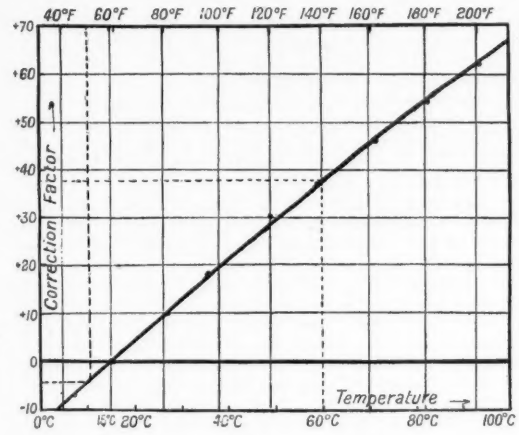
Corrected gravity is 1149 + 0·81 (85 − 15) = 1206.

By plotting the above figures graphically, the factor may be obtained at a glance.

Accompanying this is a facsimile of a large graph in practical use and which, having a prominent place on one of the walls of the writer's laboratory, has proved exceedingly useful in the daily routine of the junior chemists.

Temperature is plotted horizontally—centigrade at the bottom, Fahrenheit above. The necessary correction factor to be added to the observed reading is plotted vertically.

Suppose a sample tested at 60° C. gives a hydrometer reading of 1165. Find the vertical line passing through the 60° C. and



follow it upwards till the curve is touched. At this point, trace a horizontal line till it reaches the left-hand side, and the factor corresponding to 60° C. is obtained. In this example it will be + 38; so that the corrected gravity is 1165 + 38 = 1203.

Another sample tested 1220 on a cold day. The temperature was 51° Fahr. Find the line corresponding to 51° Fahr. at the top, follow vertically downwards till it meets the curve, and then read off the number at the side. This time it is − 5. The corrected gravity is therefore 1220 − 5 = 1215.

It is evident from the curve that the coefficient of expansion of tar varies slightly—to be accurate, it decreases with increase of temperature. This fact is usually disregarded; but the employment of the graph as illustrated will ensure the use of the *correct* factor.

Whenever a new hydrometer is put into regular use for routine work, it is best to run a fresh test and, if necessary, plot out a new curve.

PRODUCTION OF ARTIFICIAL DAYLIGHT.

This was the subject of a paper submitted to the Franklin Institute by Dr. HERBERT E. IVES, of the Photometrical Laboratory of the United Gas Improvement Company, and it is given in the "Journal" of the Institute for May. The following are some extracts from it.

COLOUR MEASUREMENT.

The author begins by referring to the number of industries in which the hours of working depend upon daylight; and he then asks: What is daylight? In order to answer this question, it is necessary to measure colour; and Dr. Ives proceeds to do this. He explains that there are two distinct methods of colour measurement—one by analysis of the light radiations into their elements and the subsequent quantitative measurement of these elements; and the second by analysis according to the effects on the visual apparatus.

METHODS OF MAKING WHITE LIGHT.

As a result of the study of colour measurement, several methods of artificially making white light present themselves. First and most obvious, theoretically, is the production of an illuminant which has the same distribution of intensity throughout the whole spectrum as a chosen daylight standard. A second method is to subtract, as by a process of absorption, those radiations in an illuminant which are present in excess over daylight. A third method is by the mixing of two or three colours respectively complementary. With these various means at disposal, the next thing is to establish criteria upon which their relative methods may be decided. Among these are efficiency and suitability for colour matching. The latter requirement, being the most important one, is next considered; and the conclusion arrived at is that if artificial daylight is to behave to all kinds of colour exactly as does real daylight, it must not only look like daylight, but must be identical with it, wave-length by wave-length, through the spectrum.

THE PRACTICAL ACHIEVEMENT OF ARTIFICIAL DAYLIGHT.

In dealing with this branch of his subject, Dr. Ives says the first kind of artificial daylight postulated as possible is a light-source which has naturally the same spectrum distribution of intensity as daylight. An incandescent black body at 5000° C. absolute would have this distribution; but such a temperature is at present unattainable. The second kind of artificial daylight is one made by matching colour to look like daylight. This is chiefly of importance as illustrating the pitfalls to be avoided. The most important method is the subtractive one—*i.e.*, the subtraction by absorption of those radiations which an illuminant emits in excess of daylight. By way of detailed explanation, the author goes through the various stages in the practical production of such an artificial daylight. He takes as the illuminant to be transformed to daylight the Welsbach mantle, which, because of its nearer approach to whiteness than the usual incandescent solids, especially recommends itself for the purpose. The first step is to determine its distribution of intensity throughout the spectrum, and compare it with that of daylight.

Cognizance must at once be taken of the fact that the colour (intensity distribution) of a mantle depends upon the composition. A mantle of pure thoria is much whiter than one of pure ceria; the light of the latter being, in fact, deep orange yellow. It is obvious that the whiter the mantle—*i.e.*, the smaller the percentage of ceria contained in it—the less light must be absorbed in order to leave daylight. As yet, however, the amount of this absorption is not expressible in useful comparative units. It is necessary to express it in terms of luminosity. The relative amount of light left after the subtraction process is called by the author the "daylight efficiency." Other things being equal, the mantle with no ceria should be chosen. But other things are not equal; for with varying percentages of ceria the candle-power of a mantle changes—rising from a minimum for the pure ceria one to a maximum for a mixture of 99 per cent. of ceria and 1 per cent. of thoria, and then again decreasing as the ceria content is increased. Mantles, through quite a range of composition—from 0·25 to 0·7 per cent. of ceria—can yield the same efficiency of artificial daylight. Above 0·7 per cent. of ceria the efficiency is found to drop off very rapidly indeed. It is only about 15 per cent.; showing that artificial daylight is necessarily an expensive product when thus secured.

THE ABSORBING MEDIA.

Having chosen a mantle to be screened, the next question is that of the absorbing media. What is the absorption needed? Putting it in terms of transmission, it is this: The transmission at each wave-length must be the ratio of the daylight intensity to the artificial light intensity when so represented that the value is unity for the extreme end of the spectrum. The absorbing medium indicated is of general blue colour. The next step is to study the various absorbing media. These are practically reduced to two—coloured glass and dyes which may be incorporated in gelatine or some similar transparent carrier. No single glass or combination of glasses at present on the market possesses the absorption called for. Cobalt blue glass, which is the first thought of every one, has several irregular bands, not a uniformly increasing transmission towards the blue end of the spectrum. Copper glass, which is blue-green in colour, has a gradual absorption, but is too green. The great advantages of glass over dyed gelatine are its permanence, and the possibility of working it into all shapes, from flat sheet to spherical enclosure. Still, dyes have the one advantage that they provide an enormous number of absorptions of both broad and narrow types. The bands and deficiencies of glasses can almost always be filled in by properly chosen dyes, though many dyes are not at all permanent. This reduces very materially the number available.

It has been found possible to make a practical combination of copper glass in sheet form with a dyed gelatine layer on a separate sheet, which accomplishes the purpose admirably, using dyes of great permanence. The commercial device consists of a small booth, closed at the back and sides, in order that stray light from any other source may not enter and mix with the daylight. Samples of cloth, tobacco, &c., are held under the glasses, and the result is identical with daylight. With the 0·25 per cent. ceria upright mantle, more than 20 foot-candles illumination is obtained on the working plane; while with a large inverted mantle the figure is multiplied by four—in either case sufficient for colour-matching purposes. The absorption of light by the glasses is about 90 per cent. The device is being used extensively in silk mills, department stores, &c.

COST OF A COMPLETE COPY OF DAYLIGHT.

The question always asked about artificial daylight is: How much does it cost to make a complete copy of daylight illumination in a room? Some figures given by the author elsewhere in connection with a study of the distribution of daylight may be of interest here. Pleasant day lighting of the room taken for study—one 16 ft. by 10 ft.—was produced when the light of the sky illuminated the whole floor of the room, when the ceiling was illuminated by the light reflected from the street below, while the opposite houses, which were in shadow, were the only outside objects visible to the occupants of the room. The bright sky, which does most of the lighting of the room taken, forms a concealed light source.

It was possible, by a construction of mirrors, to very closely duplicate the distribution of light from a window and produce an illumination about one-tenth that of real daylight at an expenditure of about 260 watts. To secure daylight intensity would need 2000 watts, whereas if the light had all been subjected to daylight producing absorption it should have required 20,000 watts. If, however, daylight could be produced directly in an illuminant without any waste heat radiation, it would not only be a much more efficient process than that indicated, but even more efficient than any present known artificial light source. Instead of 20,000 watts, 50 watts would suffice.

The author concludes by enunciating the dictum that the ultimate goal of the student of artificial daylight is the production of daylight whenever and wherever it is wanted, distributed in any desired manner, at no greater cost than our present yellow artificial light.

ALTERATION TO A CONVEYOR DRIVE.

By H. C. Widlake, M.J.Inst.E., of the Plymouth and Stonehouse Gaslight and Coke Company.

In bringing this article before readers of the "Journal," the author would venture to explain that its chief interest lies in the fact that, although the alteration was of an extensive nature, the plant in connection with which it was carried out was actually stopped for only eighteen hours; this being the longest time the conveyor could be spared without incurring heavy charges for manual labour.

A 22-bench horizontal retort-house was worked by electric charging-discharging machines, which took their charges of coal from a series of overhead hoppers running the whole length of the retort-settings, and which were kept supplied by a conveyor of the push-plate type, having a capacity of 30 tons per hour. The coal was dropped in the trough of this conveyor at three equidistant points by elevators, the boots of which were situated in a coal-store running parallel with the retort-house.

The conveyor head was carried on an overhead platform composed of two 8 in. by 3½ in. steel joists spanning the distance between the top of the benches and the retort-house wall, as shown in plan in fig. 1; the platform thus formed also carrying the driving gear. This gear consisted of a 15 B.H.P. totally enclosed shunt-wound interpole motor, direct coupled, *via* a flexible clutch, to a double helical reduction gear-box, which reduced the motor speed of 1000 revolutions per minute to 54 revolutions per minute on a double helical pinion on its far side. The low-speed shaft, on which the pinion was keyed, extended about 6 inches past the end of the pinion; this length forming a journal which worked in a plummer block carried on the conveyor head casting.

The actual driving gear consisted of a hexagon drum set in the conveyor head casting, around which the centrally running chain passed. The drum was keyed on to a shaft, which, passing through the conveyor head, *via* bearing bushes, terminated in a double helical spur wheel into which the pinion on the far side of the reduction box geared. The conveyor driving drum had a speed of 18 revolutions per minute; the conveyor chain, a speed of 100 feet per minute.

So far as the actual apparatus was concerned, there was not much room for criticism. But the gear, as a whole, was a source of continual trouble; and a series of observations revealed the following facts:

(1) The platform on which the gear rested was not structurally strong enough to withstand the strain of the drive, and a terrific amount of vibration was taking place; it being impossible to keep any single bolt or nut tight for more than a few hours.

(2) As a result of No. 1, the motor and gear box were constantly getting out of alignment to such an extent that the leathers of the clutch were frequently giving out. An abnormal degree of wear was taking place on the reduction box gears, in spite of the fact that they were running in a grease bath; and although only a year old, the whole box was a candidate for the scrap heap.

(3) The position of the platform was such as to render the operation of changing the motor, or indeed of carrying out any repairs to the running gear, an exceedingly difficult and dangerous one.

(4) The motor was operating under a continuous overload of 25 to 40 per cent.; and, owing to the abnormal conditions under which it was running, it was in a pretty bad state, notwithstanding the fact that it was practically a new machine. It was obviously liberally rated, and possessed an exceedingly robust constitution. But the reversing control ironclad panel fixed on the same platform was one of those delicately made and highly ornamental contrivances which gladden the hearts of their designers, and imperil the souls of the unfortunate individuals who have to maintain them.

The starter was constantly in use; the conveyor being frequently reversed. Its strongest recommendation in the eyes of the men who worked it was its adaptability for culinary operations; it being admirably suited to keep a can of tea or other beverage at a comfortable temperature.

The first step was to securely anchor the platform to the end wall of the retort-house. For this purpose two 8 in. by 3½ in. joists, fitted with suitable feet, were built into the end of the wall; their other ends being bolted, *via* angle pieces, to the web of the main platform joists.

This work, as was anticipated, greatly reduced the vibrations, but did not render the platform a suitable place for the mounting of such heavy duty gear; and arrangements were pushed forward for installing a totally new drive. A channel iron bed, filled in with grouting, was placed on the floor of the retort-house, and a 22 B.H.P. shunt-wound interpole reversing motor was mounted thereon. The coal-hoppers were supported for their extreme length by transverse joists 17 in. by 6 in., pitched 12 ft. 6 in. apart, and spanning (at a level of 8 feet below that of the conveyor platform) the distance between the retort-house wall and the top of the settings. Across two of these, just above the new motor bed, three 8 in. by 5 in. I section joists were bolted, as shown in fig. 1, and were fitted with plummer blocks, in which a countershaft was placed, and connected to the motor by an 8-inch driving belt; the respective diameters of the driver and driven pulleys being 12 inches and 60 inches.

The motor, running at a speed of 1000 revolutions per minute, gave this countershaft a speed of 200 revolutions per minute. In view of the extremely short period for which the conveyor could be spared, it is obvious that special arrangements had to be made for the break; and it was decided to instal the final transmission link, which was by means of a Hans Renold chain, in such a manner as would enable the greater portion of the new drive to be tuned-up before the change from the old to the new gear was made.

It will be seen from the plan that a long portion of the platform between the end shield of the motor and the retort-house wall was unoccupied; and it was along this portion that a 3½-inch countershaft, carrying the driven sprocket of the chain drive and terminating in a coupling 1 inch away from the end shield of the motor, was lined up. This shaft ran in two plummer blocks, one on each side of the sprocket wheel; each plummer block being bolted to 18 in. by 7 in. joists of I section, which were cut the exact width of the platform, and securely bolted across the main joists of same. Between, and parallel with, each of these joists and the sprocket, a 12 in. by 6 in. joist of the same length was bolted, in order to form bearers for the jockey pulley, the function of which was to prevent the chain striking the top edge of the main platform joists when running with its slack side uppermost. This arrangement of joists is shown at A in fig. 1. The new drive is shown in elevation in fig. 2.

At this point considerable difficulty was experienced in lining-up the short lengths of 3½-inch shaft to the centre line of the motor and the gear box; removal of these machines being out of the question for that purpose, and the platform joists being badly strained by the unfair stresses with which they had had to contend. Due allowance was made for this distortion; the shaft was lined-up as near as possible; and the chain-drive was fitted.

The Hans Renold Chain-Drive.

On the first countershaft, between two plummer blocks, a steel driver wheel was mounted, having eleven 1·3 inch wide teeth, and an overall diameter of 9·32 inches. The driven wheel on the 3½-inch shaft was of cast iron, having forty 1·3-inch wide teeth, and an overall diameter of 29·99 inches; while the jockey was a cast-iron 12·08-inch diameter wheel having fifteen teeth. These wheels were connected, by a Hans Renold's bush roller chain of 7·95 lbs. per foot, having a pitch of 2·25 inches and a breaking strain of 44,000 lbs.

A new reversing controller which had been ordered for the job had not turned up. The chain being finished, however, the new motor was connected up to the existing control panel in parallel with the old, *viâ* isolating switches on the Field and Armature leads, and the new gear was run light for some hours, so as to enable the motor, countershafts, and belt and chain drives to be thoroughly tuned up, and a brake test taken. The advantage which this procedure offered cannot be over-estimated, as, when the final break was made, no doubt existed in the minds of the responsible officials as to the performance of that (the main) portion of the new gear.

The last link between the chain-driven shaft and the conveyor head was now got ready. This is shown in the plan, from which it will be seen that it consisted of a length of 3½-inch steel shafting fitted on one end with a standard half coupling, and at the other with a double helical pinion—a duplicate of the one on the end of the reduction gear box. The 3½-inch shaft projected about 6 inches through the pinion to form a journal. The writer was of opinion, however, that the plummer block for the reception of this journal on the conveyor head casting was not of sufficient strength; and accordingly a third piece of 18 in. by 7 in. girder was cut and drilled to the same dimensions as the main bearing joists, all ready to be bolted at the inside of the double helical pinion immediately the gear was removed.

An all-night run enabled the depleted coal-bunkers to be filled up to the level of the push plates; and at 6 a.m. the work of transferring the conveyor drive from the old to the new gear was commenced. The motor, gear box, and their heavy steel girder bed were unbolted and lowered to the ground. This was a by no means easy proceeding; three sets of tackle having to be used, and a pair of "live" trolley wires immediately under the platform having to be dodged.

The platform having been cleared, a test showed that the platform joists had not been strained to any considerable extent. The third bearer joist were now lined-up as close to the conveyor head as the width of the double helical pinion would permit; and the holes for the holding-down bolts having been marked off, a couple of ratchet drillers were set to work, the holes drilled, and the joist bolted in position. The final length of shaft was now dropped into its bearing, and the feeler gauges put to work at the coupling faces.

Although, in view of the distortion of the platform joists, several liners of varying thicknesses had been provided, it was found that the insertion of a 1-16-inch liner under the plummer block at the near side of the double helical pinion brought the whole length of 3½-inch shafting into perfect alignment. The bearing caps having been tightened up, and the coupling bolts inserted, the isolating switches on the new motor were taken out, the machine permanently connected to the old starter panel, and the conveyor

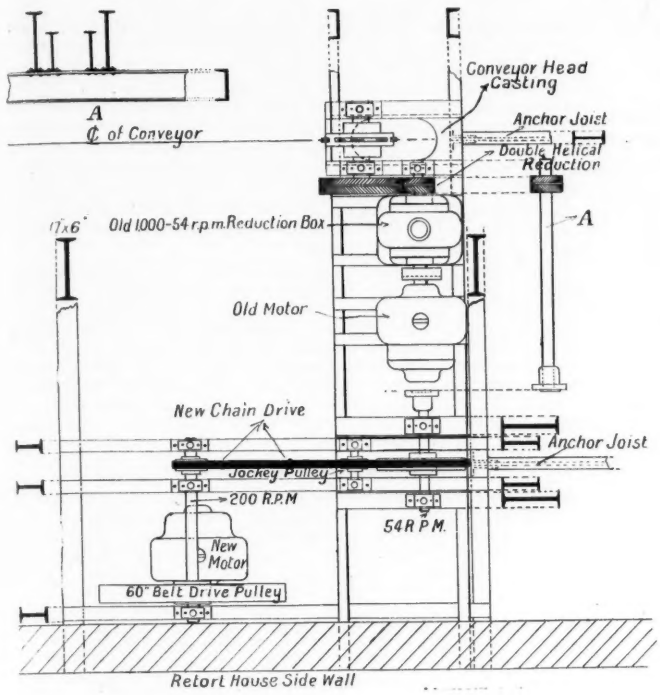


Fig. 1.

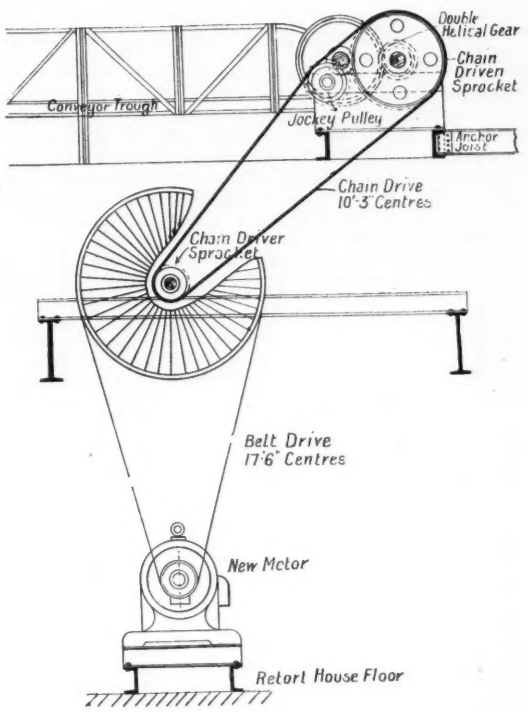


Fig. 2.

started on the new drive at twelve midnight. Thus the entire job had taken exactly eighteen hours. From the moment of starting, the new drive proved itself to be remarkably efficient and economical.

In view of the heavy overload under which the old motor had been operating, it had been decided to work the new drive by a machine of higher power; and accordingly a 22 B.H.P. motor had been installed. Considerable surprise was occasioned when it was found that the current taken by this larger motor, when working the conveyor under exactly the same conditions of load, was 30 to 40 per cent. less than that taken under the old conditions; the new machine working the fully-loaded conveyor at a load factor of about 70 per cent. This difference can only be accounted for by the increased efficiency of the new transmission over the old.

The writer does not suggest that a direct-coupled reduction gear-box, when properly installed, is an inefficient method of transmission; but the experience gained by this alteration proves conclusively that the unfavourable conditions under which this gear was installed effected its economy to an undreamt-of extent. The lining-up of the motor and gear-box on a cast-iron machined combination bed-plate would no doubt have helped matters; but this would not have removed the driving gear from the influence of the vibration which must exist, in some degree, at the head of a conveyor of this type. The motor is now changed every six months, and taken to the repair shop; the actual exchange of motor taking about half-an-hour.

An extremely pleasing feature of this new drive is the accessibility of the motor, and, indeed, of all the gear—a factor which enables the drive to be easily inspected and maintained in an efficient condition.

Since the installation of the new drive, the repairs bill to the conveyor itself has been considerably less. The author attributes this to the fact that in the event of a "hang up" the belt slips, and so relieves the gear of the strain which, in a direct-coupled installation, would inevitably be thrown upon it. It might be argued that in the latter case the fuse on the motor would relieve the strain by blowing upon the occurrence of an overload; but it must be borne in mind that a fuse is virtually a circuit-breaker set with a time-limit, and cannot open a circuit synchronously with the advent of an overload. A fuse takes an appreciable time to blow; and it is in the short period that elapses between the occurrence of an overload and the actual blowing of the fuse that damage is done.

The alteration was carried out in November, 1912, and up to the date of this article no trouble of any sort had occurred with the new transmission. No difficulty is experienced with the vertical belt drive, and, in spite of the fact that the conveyor runs twelve hours per day, no wear is apparent in the plummer blocks on either the driver or the driven chain shafts. This is no doubt due to the fact that there is a total absence of that extra wear due to the tension which, in a belt drive, it is necessary to maintain between the two shafts in order to prevent slip.

Although the ratio of transmission is certain, there is a considerable amount of elasticity in a chain-drive which makes this method of transmission a particularly suitable one under such conditions as existed in the drive which forms the subject of this article. Owing to the reversing nature of the drive, the chain runs with its slack side alternately on the top and bottom. Although theoretically the former is the less desirable condition, it is found that it works either way with an equal degree of sweetness and efficiency; while its satisfactory operation is further insured by the rigid nature of the bearings carrying the main and jockey sprocket.

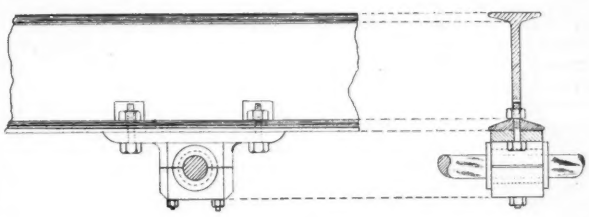


Fig. 3.

Fig. 3 shows the manner in which the plummer blocks were fastened to the I-section joists; and the rigidity thus obtained more than justified the trouble of drilling and chipping-out a cavity in the web for the reception of the nuts. A slight prejudice which the writer had against the use of a jockey pulley is quite dispelled by the thoroughly satisfactory manner in which this fitment works. It is unobtrusive, admirably fulfils the purpose for which it was installed, and does not detract in any way from the efficiency of the drive in either direction.

The control panel was later on replaced by a Siemens reversing barrel type controller, situated on the platform that has been built around the first countershaft, and which is connected down to the motor by four aerial lines.

As an item of interest to those who have charge of conveyors of the push-plate type, it may be mentioned that a very prevalent cause of overload is a tendency on the part of attendants to leave their slides open when the coal-hopper underneath has become filled up to the level of conveyor trough. The direct result of this is that as a plate comes along, pushing a quantity of coal before it, which, on arriving at an open slide, meets and mingles with the top of a heap of coal, the edge of the push-plate exercises a sort of shearing action in regard to this augmented heap; and a very few doors left open in this manner will throw a heavy overload on the conveyor.

The author trusts that the foregoing article may be of interest and service to those who, like himself, from time to time have to deal with some awkward transmission schemes, and who may find in the installation of a chain-drive an easy and economical solution of their problem.

Probate of the will of the late Mr. Charles Meiklejohn, whose death was recorded in the "JOURNAL" for the 21st of April, has been granted to his widow. Deceased left estate of the gross value of £6522, with net personalty amounting to £6348.

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

Visit to the Davis Gas-Stove Company's Works.

An excellent sessional programme was brought to an end by the London and Southern District Junior Gas Association last Thursday afternoon in an excellent manner, by a visit to the Luton works of the Davis Gas-Stove Company, Limited. It was the summer meeting, and on these occasions it is customary to combine business with pleasure. This was done to the full last week; and the outing was voted a great success by the sixty or more members who took part in it. It was a very good attendance, considering it was a mid-week visit; but there would have been a larger muster had it been a Saturday. Then, however, it would have been impossible to see the works in full swing; so everything was arranged for the best. It was the second visit paid by the Association to the works; and those present last Thursday who also attended on the first occasion were greatly struck by the developments that have taken place in the intervening seven years. There is little doubt that if they return again after the lapse of another seven years, they will experience a similar, if not a stronger, feeling of astonishment; for the Company are not standing still. As soon as any extension of one department is finished, the same process is called for in another; and at the present moment there is a good deal of work of this kind in hand. All through, the Company have been their own architects and their own builders; and as they knew what they wanted, and how to obtain it, the result has been all that could be desired. The shops are airy and well lighted; and they are all of them on the ground floor.

The larger portion of the party, accompanied by the new President (Mr. J. Hewett, of the South Metropolitan Gas Company) and the new Hon. Secretary (Mr. A. R. Griggs, of the South Suburban Gas Company), reached Luton shortly after two o'clock, and found brakes in waiting to take them to the works. Alighting at the Institute, the visitors were received by Mr. Harold N. Davis on behalf of the Company; while the Chairman (Mr. H. Addis Price) also manifested his interest in the Association by being present during the afternoon. After a brief halt, the tour of inspection began. Mr. Davis himself was in charge of the first party; and among others who also acted as guides may be mentioned Messrs. Ison, Twigg, Blackwell, and Barker. Those first impressions which we are taught to believe are so important were certainly good in the case of the Davis stove works; for as they stepped out of the Institute, the members saw the tennis courts and the splendid bowling green which are available for the recreation of the employees, and they learnt that these are only two of the many forms of sport for which there are sectional clubs in connection with the Institute. As the works were fully described and illustrated in the "JOURNAL" as recently as Feb. 10 last [p. 357], it is only necessary to say now that the visitors were afforded an opportunity of witnessing the whole of the processes carried on in the works. Nothing was kept back; but, of course, the time available being so limited, and the area to be covered so big, the inspection was necessarily a hurried one. Were it not for the fact that everything in the works has been arranged on so systematic a basis—the shops following one another in such order that hardly any retracing of steps was necessary—it would not have been possible to see so much. Quite at the start, examination was invited to some beautiful specimens of ornamental castings. These, Mr. Davis explained, had not been touched with a file; and he maintained they proved that in the South castings could be made equal to those produced anywhere else. The pattern store, with its £25,000 of stock, was a surprise to many, as was also the foundry, which covers an area of over 3 acres, and affords accommodation sufficient for about 450 moulders. Then some time was spent over the ingenious sand-mixing plant for the castings. Core-making and casting having been shown, the other processes were taken rapidly in review. It was seen how the standardization of parts is secured, and how ample are the provisions for testing before goods are dispatched from the works. The enamelling department was specially interesting, and also the works laboratory. Several of the Company's new water-heating appliances were exhibited, and their working explained—the excellent results obtained by the firm with the "Eclipse" self-contained boiler in particular being drawn attention to.

The technical department is a branch of the business on which much care and money have been bestowed; and it formed a very important part of the inspection. All new designs of goods are tested and examined in this department, piece by piece, before being passed for manufacture; and as the whole of the testing arrangements are absolutely controlled by the department, if anything goes wrong it is known where the blame should be placed. These investigations, and the analyzing of all the raw materials used in the processes of manufacture, are carried on at the works; but, to serve as an additional laboratory, the Company have fitted up a house close by with all kinds of heating apparatus, so that tests can be carried out under the most satisfactory conditions. Here the members assembled; and Mr. Twigg demonstrated to them the radiometer tests for gas-fires, and also the Leeds test. The "Shadowgraph" test it was found impossible to give a demonstration of; the room being small, and the audience large. However, Mr. Davis promised that, if the Association would fix a date next session, he would get Mr. Twigg to come and show them how "Shadowgraph" tests are done. The apparatus on which the firm are making their cooker efficiency tests was seen; and figures showing what an advance this is on the ordinary pattern of stove were quoted by Mr. Davis. There is also ample provision for testing water-heaters; and one of those in action was a sectional boiler, from which it is possible to draw at the same time a supply of hot water for domestic purposes, and another supply for radiators for warming—each coming from a separate portion of the one apparatus. The arrangements made for the testing of thermostats, &c., were explained; and then the party returned to the Institute, where they found high tea awaiting them. Before leaving the tables,

The PRESIDENT remarked that they had that day witnessed a wonderful example of progress. When the Association visited the works seven years ago, he believed it was only twelve months after the firm had transferred their works from Scotland; and the idea then gained, that the Company intended to make things go, had been justified by the great extensions of the works that had already taken place. He wished specially to acknowledge the kindness of the Chairman of the Company (Mr. Addis Price) for coming to the works that afternoon with the object of showing his interest in the Association. All of them must have been impressed with the admirable arrangement of the works. This applied not only to the manufacturing processes, but to the opportunities afforded for recreation. That the firm intended to retain their position in the front rank, was evident from the manner in which the technical side of the business was being studied.

Mr. S. B. CHANDLER proposed a hearty vote of thanks to the firm, and coupled with it the names of Mr. Harold Davis, Mr. Ison, the London Representative (who, he said, had done much to ensure the success of the visit), Mr. Twigg, Mr. Blackwell, Mr. Barker, and the other members of the staff who had assisted in giving the visitors a most profitable and enjoyable afternoon. They had seen many striking things, which provided much evidence of the good work the Company were doing.

Mr. W. J. LIBERTY seconded the proposition, and referred to the method and orderliness to be seen throughout the whole of the works. Speaking for the Association, he wished the firm continued success.

The vote having been carried by acclamation,

Mr. HAROLD DAVIS, on behalf of the Directors of the Company, the staff, and himself, thanked the members very much for their cordial acknowledgment of the efforts that had been made to give them a pleasant and instructive afternoon. It was, he remarked, a great compliment to the firm to see so large a gathering of visitors in the middle of the week. He had to apologize for the early departure which the Chairman had had to make, and also for the enforced absence of Mr. Cyril Davis. Both the Directors and the staff were proud of the works which the members had been inspecting that day. Fairly big strides had been made the last seven years; and this progress would go on. The Company had no intention of standing still; and he thought that if in a twelvemonth the members came again they would see an even larger works and a better organization than had been shown to them that day. He wished the Association every success, and sincerely hoped that this would not be their last visit to Luton, but only the second of many visits in years to come.

A short time was spent round the bowling-green—now as active a spot as the shops had been earlier in the day—and then the brakes arrived to take the visitors to the station, all thoroughly pleased with the day's outing.

A FEW NOTES ON GAS SALES.

By W. C. JACKSON, of Merthyr Tydfil.

[A Paper prepared for the Wales and Monmouthshire District Institution of Gas Engineers and Managers, May 27.]

Gas sales depend to a very large extent upon the views of the public towards gas generally, its usefulness, cheapness, and convenience as an agent of light and heat in the house, or light, heat, and power in the business, as compared with any other agent, or combination of agents, capable of answering the same purposes. This is a most important fact to recognize, as by doing so one is at once impressed by the great necessity of getting at the public, in order to lay these factors—usefulness, cheapness, convenience—very clearly before them. This, I think, can only be done thoroughly by combining advertising with canvassing; the advertisement paving the way for the canvasser, who can the more easily clinch orders where ground has been broken in this manner. Thanks to the British Commercial Gas Association, our needs in the advertising line are being pretty well catered for, though I still think that the necessity for local seasonable advertisement will never be done away with, as it seems to bring business in a manner peculiar to itself.

CANVASSING.

In the matter of canvassing, we touch upon a very important feature in promoting gas sales. Opinions vary, I know, as to the best methods to be adopted; but that some form of canvassing should be done, I believe all of us are quite unanimous upon. In the larger companies, where one or more full-time men can easily be employed going over the ground, the work arranges itself; but with the smaller companies a certain amount of scheming must be done by the manager in order to successfully carry out an efficient system of canvassing. Probably the best method to adopt in the smaller companies is to put the smartest gas-fitter on to this work for two or three days a week, until the periodical

canvass is over, and augment this with calls on the more important people by the manager himself.

Whatever methods are employed, it is necessary for the well-being of the company that every actual, or probable, consumer should be seen personally, at regular intervals—say, twice a year—and proper inquiries made as to gas apparatus required, and, very important, whether the existing fixtures are giving entire satisfaction. A really tactful person can get at troubles, smooth them over, and use the opportunity to gain a fresh footing for gas—a fact hardly understood by some managers, who seem to think complaints a nuisance, and to be treated best by taking no notice of them. We are selling a commodity—shall I say "a good commodity?"—but, like most other things, liable to vary at times in its value; and it is far better to recognize this at the beginning than to have it forcibly brought home to us by loss of consumers. Before leaving this matter of canvass, might I say how much the attitude of the gas officials generally affects the work? It is an easy task doing the rounds in a district where the officials are noted for their courtesy and willingness to meet consumers in their wants, but very difficult where the opposite applies.

Maintenance.

Fresh business gained to-day is the old business of to-morrow, and must be kept, if sales are to continue going up. This raises the question of how; and the answer can only be that of any other up-to-date business firm—give good service at the cheapest possible cost to your customer, and remember always that you have a competitor in the market against you. One of the best agents for our purpose is maintenance. A scheme such as this, run on good lines, has a wonderful effect on keeping business; small defects being picked up before they have time to develop into serious ones. Unfortunately, maintenance varies very considerably as between one works and another—rather a nuisance when strangers come to town from some remarkable place where everything is done for nothing. They look upon you as some pre-deluge being, when you meekly state your own particular terms; and, even worse, very often set a whole street or neighbourhood in arms against your company. Local conditions vary, I know; but in side lines, such as maintenance, gas-cooker hire rates, &c., a large industry such as ours ought really to be working to some recognized standard.

Our own particular price in Merthyr Tydfil is 2d. per burner per month, for which sum we give minimum visits of at least one per month, cleaning glassware, regulating the burner, and renewing damaged mantles. We supply glassware to consumers on maintenance at 5 per cent. above net cost. These prices have been in vogue for two years now (previously the charge was 3d. per burner per month); and maintenance has developed wonderfully. The actual net cost to the Company of this maintenance works out at 1·72d. per burner per month, so that we clear expenses. [We use only the best 4½d. mantles: and time is charged for at 6d. per hour.] To reduce supervision as much as possible, we get consumers to sign the fitter's sheet, after time and materials are entered thereon. This is a pretty necessary arrangement in any case, as previous to adopting it we had complaints of non-attendance at the quarter end; and it was the fitter's word against the consumer's—an unpleasant condition of things to put right.

Knowing the undoubted advantages of maintenance as an aid to retention of business, and also having seen how this price of 2d. per burner, small though it be, keeps the majority of consumers from going in for it, the question has often arisen in my mind, What should we do? Should we be justified, for the advantage likely to be gained, in running the scheme at a dead-loss of so much per month per consumer; and, if so, how small or large a sum should it be? I, personally, am of the opinion that it would be wise to do this; but as to the amount to be given off, I have my doubts. I also hesitate to say whether it should be in the form of a reduced inclusive sum per burner or as so-called free maintenance. The latter sounds well; but I have heard complaints about it costing too much, and also about the difficulty with the charges for mantles supplied—consumers being gifted with the habit of blaming the maintenance fitter for broken mantles. Perhaps some of my older friends will help me in the matter.

Included in this subject of maintenance is the question of how wide a field should be covered. Lighting must be done; but we have still left to consider fires, radiators, gas-engines, and other gas-using apparatus. From my own experience, I have seen the necessity for covering everything in this line; but the difficulty is to formulate a scheme that will be workable and not too expensive to either consumer or company. We have not yet adopted in Merthyr Tydfil any set maintenance scheme to deal with these, but are moving that way. We send round each autumn to every gas-fire and radiator on our books, and put them in order, charging only the bare cost of such attention. This has proved of great benefit to our consumers. But we still hear from indirect sources of Mr. So-and-So's fire giving trouble; and I, personally, think maintenance at more frequent intervals must come, before the best results can be attained. It is common knowledge to most of us that consumers often grumble to friends for weeks before they will think of sending to the gas office.

Fires and Cookers.

In seeking to popularize gas, it is a great asset to get the local doctors on one's side. We found this to be the case two years ago, when we were adopting a forward movement with gas-fires. We tried the scheme worked by the Gas Light and Coke Company, as set forth in the paper read by Mr. H. H. Creasey at the Manchester meeting of the British Commercial Gas Association in 1912*, circularizing each doctor in town, drawing attention to the great improvements that had been made in the gas-fire and offering to fix a modern fire in exchange for any old pattern one there might be about. I followed these up myself, and saw every doctor personally. The scheme was very successful, and has brought us not only the good will of these gentlemen, but, through their recommendation, many a gas-fire order.

We do not hire fires or radiators; but we sell, if required, on hire-purchase. Geysers and circulators are not in very great demand with us; but the ones we have put out are giving every satisfaction, and we are hopeful. This type of apparatus is still too costly. Practically everyone can be made to realize their convenience; but the money is the drawback. We have not adopted any special free system for disposing of cookers. In fact, we only keep a very limited number for putting out on hire; all others being either sold outright or on the hire-purchase system. We certainly do a very cheap hire-purchase cooker, of thoroughly good construction, with packed oven, charging only £2 15s. if bought outright, or £3 spread over three years—10s. deposit on signing the hire-purchase agreement, and 4s. 2d. per quarter for twelve quarters. This may be considered an old-fashioned policy by some; but with a purely colliery working-class population such as ours, we consider it to be the wisest. We manage to put out quite a large number each year; and we are certain of these being used. We have no bogey of cleaning and repairs expenses looming up in the future, nor yet the sight of large stocks of cookers lying in our yard waiting cleaning—a not unusual sight at works where free cookers are all the go.

Shop Lighting.

The question of shop-front lighting is very important, as besides the actual increased sale of gas, the advertisement gained is a considerable one, and reflects upon the general sales. Electrical competition is also for the same reason very keen in this branch. The electricians fully appreciate the effect upon the public mind of a street of well-lit shops. No doubt in the larger centres high-pressure lamps take the lead in fighting competition; but their advantages are not within the reach of the smaller companies The capital charges are far too high for any return likely to be gained; and even advertisement can be paid for at too high a price. However, there are several splendid low-pressure high candle-power lamps on the market; and with their assistance even keen electrical competition can be successfully fought.

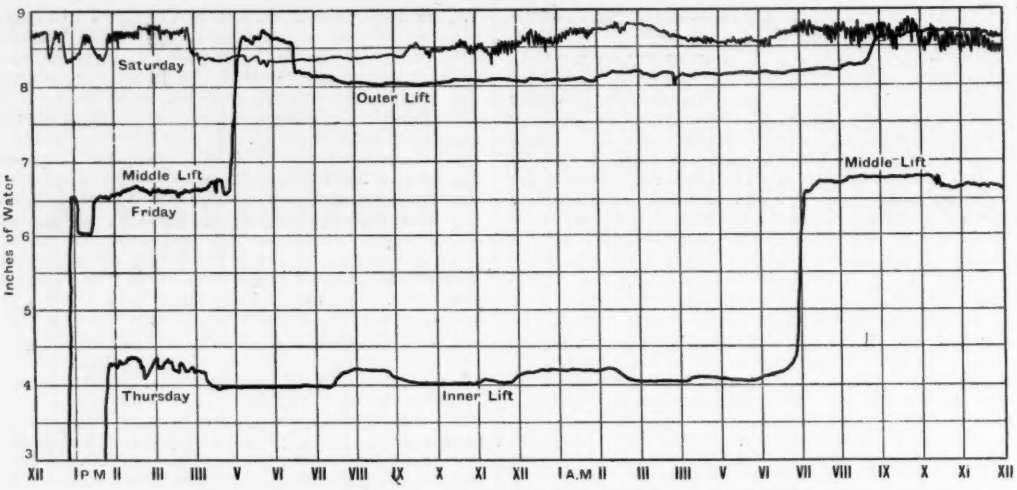
We went ourselves two years ago into the question as to the advisability of installing high-pressure gas, but after weighing everything up decided to drop it and try some low-pressure high candle-power lamps. We let these out on hire-maintenance, charging £1 per year; this sum including hire, and also regular cleaning of the lamp and renewal of damaged mantles. Gas is paid for in the usual way. We also give the hirers an optional purchase clause, whereby they can obtain the lamp for themselves—after the expiry of one year at £2 10s., two years £2, and three years £1 10s. The scheme has turned out a real success. Not only have we held ground, but we have actually displaced quite a number of electric arc and other lamps. The lamps have given us very little trouble. We have had new bye-passes fitted, as the old type was our source of greatest complaint.

On p. 717 are a series of curves, showing the average cost of upkeep of these and several other lamps. No. 1 is the lamp in question, rated at 720-candle power; No. 2 a similarly rated lamp of another make; and Nos. 3 and 4 ordinary low-pressure 350-candle power lamps. These curves are interesting, as they show the variations each month in the maintenance upkeep; but they are even more important in comparing one lamp with another. Though the final result shows the two 720-candle power lamps practically alike in their cost of upkeep, and the same with the two 350-candle power lamps, you will notice that the monthly costs vary considerably. This is owing to Nos. 1 and 3 lamps being designed to work without inner glasses; Nos. 2 and 4 having them. From my experience, I have found the first-named type to give the best satisfaction, as, besides a greater freedom from broken lamp bowls, the light is steadier and does not suffer from obstruction by small "danger signals," as inner glasses frequently attain to. Lamp No. 3 has given excellent results in our district, and, as will be seen from the curve, is very low in maintenance upkeep. No. 1, which is our usual hire-maintenance lamp, is also a cheap lamp to maintain; costing only 7s. 11d. per year for attendance and mantles, which well enables us to run the scheme at a profit. After the experience of previous makes of outside lamps, with their accompanying worries, it has been a great boon to us to meet with such reliable lamps as the ones I have mentioned.

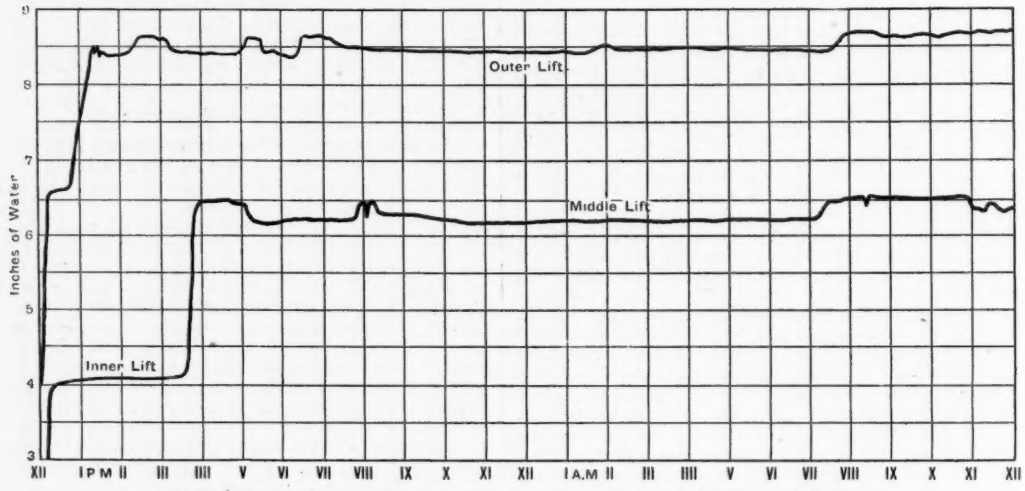
Gas of Constant Quality.

The great importance of supplying our consumers with gas of constant specific gravity and at constant pressure has been pointed out by more than one gentleman present to-day; and I would again emphasize the necessity for doing so. It only requires once going into premises where all the lights are on the dance, through large admixture of carburetted water gas, to realize the importance of the first; and to try and get good results with inverted burners

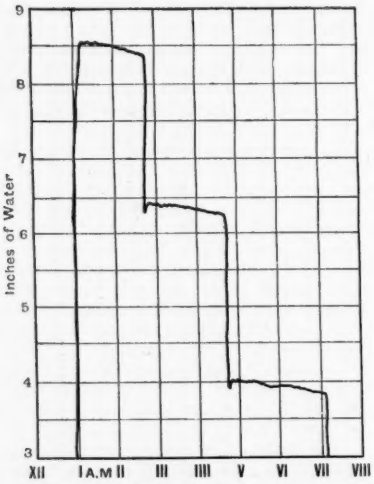
* See "Journal," Vol. CXX., p. 201.


Saturday
Outer Lift
Middle Lift
Friday
Middle Lift
Thursday
Inner Lift
Inches of Water
XII I P.M II III IIII V VI VII VIII IX X XI XII I A.M II III IIII V VI VII VIII IX X XI XII

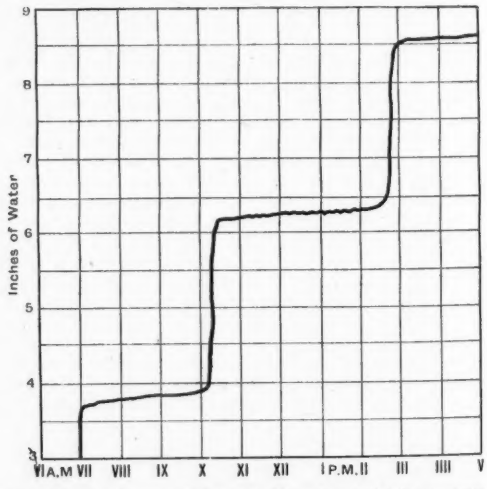
Pressure Chart Showing Variations Previous to Any Roller or Other Adjustment.


Outer Lift
Middle Lift
Inner Lift
Inches of Water
XII I P.M II III IIII V VI VII VIII IX X XI XII I A.M II III IIII V VI VII VIII IX X XI XII

Pressure Chart Showing Improvement Made through Adjustment of Rollers and Carriages.



Pressure Chart taken when Lowering Holder after all Adjustments had been Made, May 21, 1914.

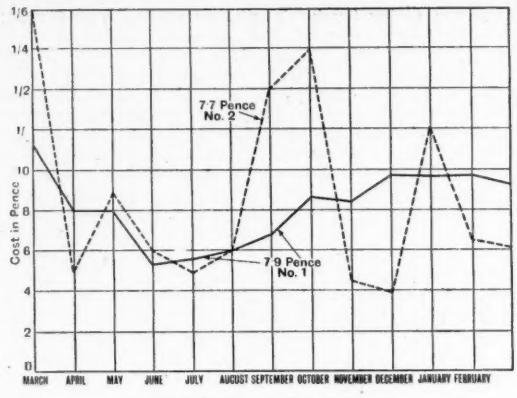


Pressure Chart taken on Raising Holder after All Adjustments had been Made, May 22, 1914.

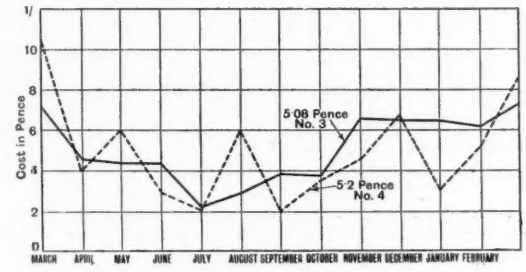
where pressures vary throughout the evening from 35-10ths down to 15-10ths, to equally realize the great importance of the second. There are cases, no doubt, where such variations cannot be helped, if the outside districts are to have anything like pressure at all; but this state of affairs ought not to be allowed to go on. It is up to the company either to grade their mains to suit requirements, or else supply service governors free to the consumers in question. We gas men may consider it a mere trifle to just touch the regulator once or twice throughout an evening; but I find consumers generally have an aversion to meddling with such things, and I am myself of the opinion that they are perfectly right. It is our duty to supply our commodity under the best conditions for general use.

The Thorp Recorder.

To keep in touch with district pressure requirements, it is highly advisable to take, at regular intervals, pressure charts with a Thorp or such-like recorder, as only by doing so, and regulating pressures and main-laying operations to suit, can we really expect to keep in any way free from complaints, and incidentally retain and extend our business. In an aside, it may be news to some to hear of another sphere in which Thorp's recorder can be of great use. I refer to the testing of new gasholders for binding. We have had a recorder, of special depth (loaned to us by Mr. L. W. Nuttall, of Gosport), connected to our new 400,000 cubic feet spiral-guided holder during the whole period of testing, and so have located binding which might otherwise have gone on



720 Candle-Power Lamps.



350 Candle-Power Lamps.

Curves Showing Cost of Lamp Maintenance.

unnoticed. As a result, we have now a holder about as perfect, mechanically, as it is possible to obtain. Several of these charts are on view [see p. 716], and the difference between the first, before tuning-up, and the last, after roller adjustments had been made, is very clearly seen.

Gas-Engines.

As a good day-load consumer, gas-engine business is always well worth striving after; but we must be alive to the points of weakness inherent in the gas-engine, if we are to retain or extend sales in this line. We owe a good deal to Mr. Thomas Canning, of Newport, for his writings on the gas-engine. His figures give one every confidence to push against electrical competition; but the question of regular attention to the valves, piston-rings, bearings, and water circulation cannot always be left to the consumer, if satisfaction is to remain continuous. Quite recently I was called in to a gas-engine that would not nearly run up to its rated speed.

The attendant laid special stress upon the fact that the valves and piston were in perfect condition. The cylinder jacket wall showed at once what was the actual cause. After thoroughly washing-out the water space—it was almost entirely filled up with sediment—the engine went away splendidly. In another case, where I was called in to a new gas-engine which could not be made to run up to its guarantee, and where, of course, the fault was put upon the quality and pressure of the gas, the trouble turned out again to be lack of circulation through the jacket, this time caused by the rising return flow pipe from the water jacket, which, instead of having an easy fall from the tank back to the engine, had been fitted with a fall in the reverse direction, so that practically no circulation was taking place, and the engine was running with the cylinder almost at a seizing heat.

To my mind, it is only when an interested party, like the gas supplier, is dealing with such matters that consumers get the efficiency from the gas used that they are entitled to; and for this reason, and bearing in mind all the features of modern competitive business, it is bound to resolve itself, sooner or later, into gas suppliers generally becoming responsible for the efficient working of every apparatus in which their commodity is being used.

Early in my paper I made use of the following phrase, "Give good service at the cheapest cost to your customer, and remember the firm has competitors in the market against them." This is from a printed slip which, I believe, is sent out at regular intervals by a large firm to their branch shops. In conclusion I only say, "Go thou and do likewise." But before sitting down, I would just like to draw attention to two relics of past inventive genius, fished out of an old cupboard recently by my chief, Mr. Kenshole. They show that the workers in the gas industry a generation ago were men of parts. The positive index reading dial-plate is a bit of real mechanical genius. This index has gearing which makes the pointers jump forward and cover the figures, in place of the usual steady forward movement of pointers in general use—making the reading positive, and eliminating sources of error. Inspectors to-day would often be the better for them. The automatic pressure lighter shows that much time must have been given to this question long before we younger members of the gas profession knew anything about gas-making.

COKE SCREENING AND LOADING MACHINE.

The Société Nicolas et Triquet have taken out a patent for France [No. 464, 844] for a movable machine to receive the coke drawn from retorts, screen it, and load it into trucks for conveyance to any required destination. The machine consists of a truck provided with a motor (preferably electric), which not only moves it to and fro, but also actuates the screening mechanism in such a way that the coke is deposited, according to its size, in one or other of the trucks provided for its removal, which are placed on two tracks parallel to the retort-benches and the track on which the truck runs.

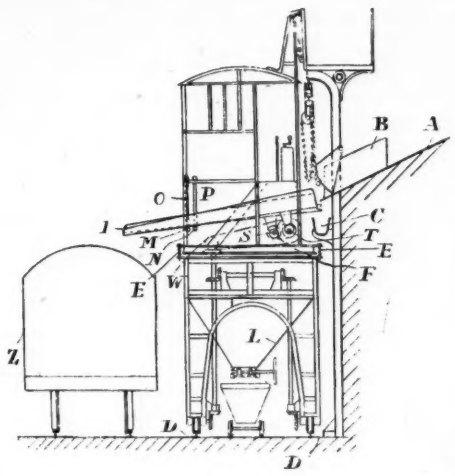


Fig. 1.

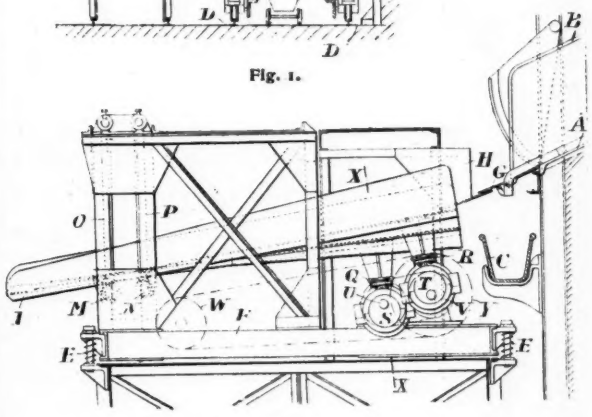


Fig. 2.

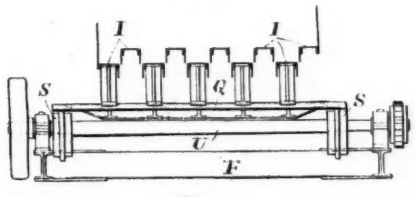


Fig. 3.

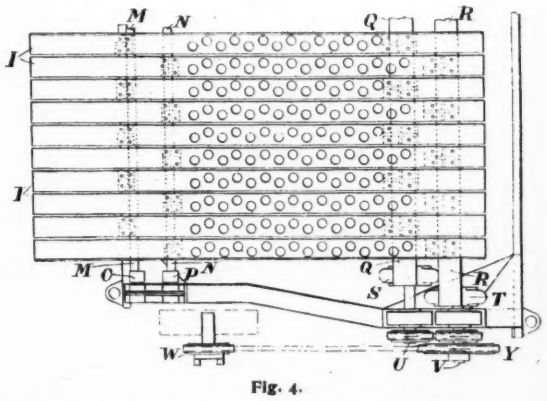


Fig. 4.

The above diagrams show the arrangement of the mechanism, and the accompanying description will give an idea of its operation. Fig. 1 is a side elevation of the machine; fig. 2 is a side view, on an enlarged scale, of the portion comprising the screen; fig. 3 is a transverse section on the line X of fig. 2; and fig. 4 is a plan of the screen.

In fig. 1, A is the slope on which the coke slides when it leaves the retort for conveyance to the hopper B, the door of which can

be worked (with the tackle shown) by the man driving the truck, who from his box can do everything necessary. C is the gutter to convey away the water employed for quenching the coke. The motor truck is constructed of iron of special section, and forms a bridge at its lower part, so that the rails for the truck to carry away small coke are placed between those upon which runs the motor truck shown at D. The wheels of the latter are driven by suitable transmission gear from the motor. The part of the motor truck forming the bridge is furnished with shock-resisting springs E, and a frame F, on which the screen, motor, driver's box, and other adjuncts are placed. The inclined bottom of the hopper is prolonged downwards by an iron plate G (fig. 2), under which the bottom (with similar inclination) of the receiving hopper H can partially lodge. This hopper serves to convey the coke to the screen when the latter is opposite one of the retorts.

The screen (fig. 4) is made of bars I with slight spaces between them, preferably ⊔-irons with the wings turned downwards, and perforated with holes of suitable diameter, so that the small coke can pass through them to fall into the truck K after being caught in the hopper L. The bottom of this hopper can be closed or opened with a sliding damper provided with two racks with which two toothed pinions are engaged; these pinions being keyed on to the same shaft, which can be made to rotate by working the fly-wheel shown in fig. 1.

The bars are not only inclined, but are hinged at one end, respectively on axes M and N, according as they are in an even or uneven row; and they are united by suitable supports. The axes are held in suspension at their extremities by the rods O and P, which are themselves hinged at their upper extremity on fixed points of the motor truck. The other extremity of the bars is supported either by the rod Q or the rod R, which are suitably connected to the collars of the eccentrics S T placed at both of their extremities. Two of the eccentrics are respectively keyed on to the shafts U V; and upon these shafts are keyed pinions united with each other by a chain. A wheel is also keyed on to the shaft V, receiving motion through the agency of the chain of the toothed pinion W driven by the motor. A fly-wheel to regulate the working of the screen can be usefully placed on one of the shafts at the end opposite the pinion. The eccentrics are keyed at 180° to each other.

It can be at once understood that the rise of the bars of an uneven row is effected during the fall of those of an even row, and inversely during the time of rotation of the wheel Y, so that not only does the coke tend to descend by reason of the incline of the screen upon which it is placed, but also owing to the movement of the bars, the pinions of which rotate to produce this effect in the direction of the arrows shown. This combination of shaking movement of the bars and their relatively slight inclination facilitates screening, because otherwise, if the bars were fixed and more inclined, the same lumps could easily slide upon them, whereas they all fall through the holes to be caught in the hopper L, and then the truck K. With regard to the larger lumps, they fall from the end of the bars I into the truck *Z*. The coke from each retort is successively screened and collected; and the motor truck and trucks K and *Z* are displaced each time for the purpose. When the two trucks are full, they are run away and replaced by others. It is claimed that by the invention work is rapidly executed with durable plant, which is easy of management.

RELATIVE HYGIENIC EFFECTS OF ELECTRIC AND INCANDESCENT GAS LIGHTING.

THE "Electrician" of the 29th ult. contained a translation of a paper on this subject that appeared in Vol. XXIII. of the "Annali d'Igiene Sperimentale" (published in Turin). In introducing this subject, our contemporary says: "In view of the strong claims made by advocates of gas lighting in favour of its hygienic properties, the following careful experiments were made by Dr. E. Ronzani, of the University of Padua, to investigate impartially whether these claims were justified." [A comment on the "carefulness" and "impartiality" appears on an earlier page of the "JOURNAL" to-day.]

One of the principal advantages claimed for gas is the improvement in the quality of the surrounding air, both chemically and physically. On the chemical side it has been said that, although the combustion of gas causes a diminution of oxygen, and produces small quantities of carbonic acid gas and sulphur dioxide, this is compensated for by the gas burning the noxious organic impurities in the air. On the physical side, the increase of temperature produced by the combustion is said to help ventilation—incidentally bringing into contact with the flame any organic exhalations that may be present. It is further asserted that the gas-flame with its high temperature sterilizes the air by cremating the micro-organisms that come in contact with it.

In view of these current beliefs and statements, Dr. Ronzani undertook the investigation of the following points:

1. To determine the principal changes in the air of a room lit by gas and electric light respectively.
2. To verify if incandescent gas lighting had the effect of purifying the air from the products of respiration, &c.
3. To ascertain the influence of gas and electric lighting respectively on the natural ventilation of the rooms in which they were used.
4. To ascertain what effect incandescent gas or electric lighting had on the health of animals in the room.

In order to carry out the investigations, he constructed a test-room or cupboard of stout glass panes framed in oak, well puttied and varnished, and floored with porcelain tiles so as to make the whole air-tight. This test-room was 2 metres high, 1·25 metres long, and 0·6 metre wide.

The internal arrangements were as follows: Approximately in the centre, an incandescent gas-lamp was fixed, provided with an automatic lighter. Near this there were hung: (1) a metal filament electric lamp of a candle power equal to the gas-mantle; and (2) an electric lamp with carbon filament. On one side there was an electric fan. A number of thermometers were mounted at different heights; while various tubes fitted with taps communicated with the outside air. Small bellows and aspirators were attached to these tubes, so that samples of the air inside could be taken during the experiments. In addition to these test openings two large holes were provided—one at the bottom and one at the top; these being capable of being adjusted in size or sealed hermetically so as to regulate at will the ventilation of the chamber. This test cupboard, as described, was placed in a laboratory provided with large windows and doors and heating apparatus so as to control the external conditions.

It was found preferable to use a cupboard of somewhat restricted dimensions so as to be able to close it hermetically, and to regulate the ventilation easily. This enabled the tests to be made more accurately on the different gases, and obviated experimental errors.

I.—CHEMICAL AND PHYSICAL CHANGES IN THE SURROUNDING AIR.

Although several researches have been made on the older types of gas-burner, the author could find no earlier reference to the deleterious effects on the surrounding air of incandescent gas, except in an article by Gellmuyden dealing with gas produced from German coal in the works at Christiania. For the present experiments the gas, made from English coal, was supplied from the Padua Gas-Works. This gas contained on the average 38 per cent. of methane, 5 per cent. of other hydrocarbons, 2 per cent. of carbonic acid, 3·5 per cent. of nitrogen, and 6 per cent. of carbon monoxide. The qualitative and quantitative chemical experiments on the air of the test cupboard, before and after the burning of the lamps, dealt with the following substances: Oxygen, CO_2, SO_2, H_2S, NH_3, nitrous and nitric acids, methane, and other hydrocarbons. The temperature and humidity were also observed.

At the commencement of each experiment fresh air was ensured in the laboratory by opening the doors and windows. In the test cupboard the large ventilating holes were opened, and the air was renewed by working the electric fan. Preliminary readings were always taken of the temperature of the surrounding air, the barometric pressure, and the humidity. In certain experiments tests were made for the presence or absence of the gas which was being investigated. Samples of the air inside the cupboard were taken by means of a bellows communicating with the interior, or by aspirators—the fan being previously run so as to mix the air thoroughly.

With the cupboard hermetically closed, the gas-mantle retained its initial brilliancy for about an hour, but gradually became duller during the next half-hour. At the end of 1 hour 40 min., the gas was extinguished for lack of oxygen. This test was merely to prove that the cupboard was thoroughly air-tight.

(*a*) *Oxygen.*—The method adopted was that of Liebig, with potassium pyrogallate. The proportion at the commencement of the experiment was 20·6; after half-an-hour's burning it fell to 17 per cent.; after one hour to 13·6 per cent.; and after 1½ hours to 10·5 per cent. From these figures it was calculated that this particular mantle, taking 150 litres of gas per hour, consumed 125 litres of oxygen, equal to that contained in 600 litres of air, and almost identical with that required for five persons. The gas went out automatically after it had consumed about half the oxygen in the cupboard. Experiments were made by introducing rabbits and guinea-pigs into the cupboard; and it was found that after three or four hours they experienced very little discomfort even when there was insufficient oxygen to keep the gas alight.

(*b*) *Carbonic Acid.*—The qualitative and quantitative experiments were made by Pettenkofer's method, using barium hydrate. The following is a summary of the results: Before lighting the gas the air in the cupboard contained 0·4 to 0·5 part per thousand. After half-an-hour this had risen from 1·4 to 1·5 per cent. After an hour (150 litres of gas burned) the quantity had risen to 3 per cent. This type of mantle produced hourly 52 litres of carbonic acid gas, corresponding approximately to that produced by two adults when at work.

(*c*) *Carbon Monoxide.*—It was thought possible that CO might exist in the air surrounding the gas-flame, if there were incomplete

combustion. The presence of this gas is of great importance in view of its toxic properties; it may cause symptoms of poisoning when present to the extent of only 0·1 part per thousand. The most careful tests (applied on three different methods) failed to give any measurable traces of CO in the air of the cupboard after one hour's burning with a gas-mantle in good condition. Slight evidences of CO were, however, found when the supply of oxygen was diminished enough to affect the incandescence; also in the case of a gas containing originally more than the amount usually allowed—*i.e.*, 7 to 8 per cent.

Sulphur Dioxide and Sulphuretted Hydrogen.—The presence of H_2S causes the production of SO_2 by combustion. Both these gases are very irritating in their effects on respiration, and they also tend to discolour walls and ceilings and corrode metal objects. As the result of a series of tests, it was found that SO_2 was present to the extent of 0·04 per cent. after one hour's burning. Even this very small quantity was recognizable by its characteristic and objectionable smell. It is ridiculous to allege (as has sometimes been done) that the SO_2 is useful as a disinfectant, as its powers in this diluted form are negligible. The tests failed to indicate any appreciable traces of H_2S in the air, showing that with the incandescent mantle any quantity present in the gas is completely oxidized.

(*d*) *Nitrogen Compounds, Ammonia, Nitrous and Nitric Acids.*—According to Bibra and Rubner, minute quantities of these acids produce bad effects on persons and animals breathing the air—due to the hæmoglobin of the blood being converted into meta-hæmoglobin. This change is said to be the cause of the oppressive feeling experienced after a prolonged stay in a badly ventilated room lit by gas. Careful experiments showed that only the faintest traces of either nitrous or nitric acids existed, although ammonia was found to the extent of 0·02 per cent.

(*e*) *Methane and other Hydrocarbons.*—Repeated tests failed to indicate the presence of any unconsumed hydrocarbons after the gas had been alight for an hour—showing that combustion with the gas-mantle is practically complete.

(*f*) *Physical Changes in the Air.*—The lessons derived from the use of such a small test-room are not, perhaps, immediately applicable to large rooms; but it is interesting to note that after one hour's burning of the gas, the temperature of the lower strata of air rose 8° C.; in the middle of the box, to 16° C.; and at the top, to 40° C. With the carbon electric lamp alight and the gas extinguished, the corresponding rises of temperature were ½°, 1½°, and 2° at the top. With the metal filament lamp the figures were 0·3°, 0·7°, and 1°.

(*g*) *Humidity.*—Readings of the humidity were made with the August psychrometer fixed inside the room and manipulated from outside. After one hour's burning of the gas, the relative humidity rose from 61 to 87 per cent. and to 90 per cent. after 1½ hours. Considerable quantities of vapour were condensed on the glass sides, especially in the lower part and on the floor. Quantitatively, this moisture amounted to 0·9 gramme per litre of gas burned. In the case of the electric lamp the effects were the reverse; after one hour's burning the humidity fell from 61 to 60·5 per cent.

II.—Purification of the Air.

The second part of the experiments was undertaken to ascertain if the burning of gas in a room really had the property of purifying the surrounding air from the products of respiration and other organic exhalations. The sense of heaviness experienced in a badly-ventilated room is not due alone to the presence of exhaled organic matter; but this is an important cause. Ammonia produced by breathing is one of the principal of these impurities; and in hospitals as much as 0·668 milligramme has been found. Small quantities of methane, hydrogen, and sulphuretted hydrogen are also liable to be present with bad ventilation.

The following is a summary of the results obtained after the introduction of definite quantities of ammonia into the test cupboard; it having been verified by a previous experiment that there was no appreciable leakage after the NH_3 had been introduced for at least an hour. After the gas had been lit for an hour, the proportion of NH_3 had diminished to about half its original amount. In the case of the electric lamp, the diminution was not more than 1 or 2 per cent. Although this appears to corroborate the claims made by gas advocates, it is well to add that although the NH_3 has been chemically transformed, the last state is worse than the first; for it now appears as nitrous acid, evidence of which in abundance was obtained by Dr. Ronzani.

The tests with sulphuretted hydrogen gave very similar results. After one hour's burning of the gas-mantle the quantity had fallen to about half its original value. On the other hand, the electric lamp did not produce a change of more than 1 or 2 per cent. Here, again, it is to be noted that the chemical change undergone by the H_2S yields a final product (SO_2) even more noxious.

Tests were also made to find out what effect the gas-flame had on volatile organic fatty acids mixed with the air. Shortly, the procedure was on the lines of the method of Kubel-Tiemann for determining organic substances in water. The effect of the gas appears to be that the volatile organic acids (palmitic, oleic, &c.) were not actually burned, but that they underwent a partial decomposition due to the movement of the air—an effect which was obtained in substantial proportions by merely agitating the air with the fan.

Some final experiments were made on the organic impurities given off by dirty clothes, but in this case, after the gas had been alight for at least an hour, very little change in the amount of these impurities could be detected.

III.—Ventilation.

Without going into details of the arrangement for measuring the movement of the air with the two kinds of illumination, the general results were as follows: With the admission and exit holes for air each of 34 mm. diameter, the flow through the test cupboard was equivalent to a complete renewal about 0·75 time per hour in the case of gas. With electric light the corresponding figure was 0·25 time per hour.

With the apertures double the size, the relative flow of air was somewhat more in proportion for the gas lighting. Although this experiment appears to be favourable to gas lighting *quâ* ventilation, it must be remembered that in any case a considerable flow of air is a necessity for maintaining the gas-mantle properly incandescent. The aperture of 34 mm. diameter was found to be barely sufficient for this purpose. The experiment referred to in No. II., on the organic exhalations from dirty clothes, was repeated, with special attention to ventilation. With apertures of 34 mm. diameter there was no marked difference in the results for the gas and electric lamps. It was only with the apertures increased to 68 mm. diameter that the figure for gas became about twice as favourable as for electricity.

IV.—Relative Effects of Gas and Electric Light on Animals.

The animals experimented on were three rabbits and three guinea-pigs, which were first put into the test cupboard with the gas constantly alight and with an air outlet and inlet of 34 mm. top and bottom. The animals were placed in two cages about 50 cm. under the gas-lamp, and at the sides of the cupboard. The position was much the same as that of the occupants of a room in relation to ordinary gas-lamps. The animals were regularly weighed; and a test was made each day on their blood to determine the amount of hæmoglobin and the number of red corpuscles. By the end of the first day the animals appeared to have difficulty in breathing; but this effect diminished after one or two days. During the whole of the experiments the temperature was about 29° C., and the air contained about 10 per cent. of CO_2 with a relative humidity of 75 per cent.

After fourteen days the animals experienced marked difficulty in breathing, and in sixteen to eighteen days five of them were dead. The rabbits lost in weight on the average 465 grammes, and the guinea-pigs 90 grammes; while a very noteworthy diminution in the amount of hæmoglobin and red corpuscles was found in the blood.

The same experiments were repeated with electric light. The internal temperature varied from 26° C. to 28° C., and the relative humidity was from 60 to 65 per cent. None of the animals displayed any signs of suffering during their stay in the cupboard electrically lit, and with the same apertures as before. Far from losing weight some of them actually gained. There was a slight reduction in weight in three cases, but scarcely any appreciable change in the hæmoglobin and the number of red corpuscles.

It is abundantly proved, therefore, that a prolonged stay in a gas-lighted room with poor ventilation is very prejudicial to animal health, while practically no ill effects are attributable to electric light under similar conditions.

To summarize, the net result of Dr. Ronzani's experiments is to show:

1.—That the electric lamp, besides not producing chemical impurities like the gas-lamp, does not sensibly affect the temperature nor humidity of the air. On the other hand, the incandescent mantle, when clean and working properly, does not throw off any carbon monoxide, sulphuretted hydrogen, or unconsumed hydrocarbons.

2.—In the second series of experiments it was shown that although gases like ammonia and sulphuretted hydrogen and other respiratory products are chemically changed by gas lighting, it is usually into substances more noxious than the original. Other organic impurities in the air surrounding the gas-lamp were not appreciably destroyed.

3.—In the third series it was shown that gas illumination causes, as was to be expected, a greater flow of air than electric lighting.

4.—In the fourth series it was shown how detrimental gas lighting is to animal health.

The main feature favourable to gas in the whole range of experiments is the more active movement of air than with electric light; but this is a claim that should be advanced with some caution. There are far more satisfactory means of securing proper ventilation in a room than the ingress of a large amount of air due to the heat of the gas lights, since much of this air in the ordinary way is vitiated by contact with organic impurities. Generally speaking, where the rooms are not too small, and have not too many occupants, gas lighting need not be discarded as actively injurious. [The experiments with live animals illustrate the most unfavourable conditions and the maximum possible evils of gas.] It is, however, impossible to maintain that incandescent gas is preferable to electric light from the point of view of health.

Midland Junior Gas Association.—Next Saturday the members will pay a visit to the Stourbridge Gas-Works, where they will be received by the Engineer and Manager (Mr. C. H. Webb, M.Sc.), who will, after the inspection, entertain them at tea. This will be followed by a ride, in a special tramcar, to Kinver.

AUTOMOBILE OPERATION IN THE OLD COLONY (MASS.) GAS DISTRICT.

At the last Meeting of the New England Association of Gas Engineers, a paper recording his experience in operating automobiles in Old Colony (Mass.) was read by Mr. G. A. SMITH, who is associated with the local Gas Company. The following are some extracts from the paper.

The advent of the automobile widened the field for the high-pressure gas system covering a number of scattered small towns. Many of such companies, now successfully operating in suburban districts, would not be able to exist if forced to resort to horse service, with its low radius of operation and high cost per mile. There have of late been published so many reviews of automobile working, giving details of construction of the various makes, with their cost of operation, that it has been thought best to confine the paper mainly to the experience of the author's Company and that of some other New England companies.

The "fleet" of the Old Colony Gas Company consists of a 3-ton truck, a 2-ton truck, two half-ton trucks, a touring car for the manager (to be rebuilt into an emergency truck), two 20-H.P. runabouts, which were used by the superintendent and the "new business" manager, four low-power runabouts, for the complaint and maintenance men, and five motor-cycles for foremen, inspectors, and street clerks. Some of these cars saved their cost many times over during the construction period. During the first year, the 3-ton truck was operated day and night delivering pipe and supplies for the main gangs, moving heavy machinery from the railroad to the works, moving Italian labourers about the work, and supplying their camps. Since then it has not been subject to such long hours, but is used for all the heavy work required, from hauling pipe for the mains to the supply of coal for the works. This truck is of chain-drive, equipped with speed governor, has an extra long body, and is built to handle 40-feet lengths of pipe. Because of its great endurance and capability of being always on the road, this truck has been nicknamed by the employees "Old Reliable." Despite its strenuous use, it shows but slight wear, and has cost little for maintenance.

The 2-ton truck was purchased in 1912, and operated part of the year and during all 1913. It is of worm-drive, and when purchased was equipped with a steel worm, which soon wore out and was replaced by the makers with one of bronze. Since then it has been operated for more than a year, and the bronze worm shows only few traces of wear. The two half-ton trucks are touring cars chassis, equipped with truck bodies. They are used for light store-room deliveries, service and main work (apart from delivering pipe), and emergency work. One weakness of these trucks is that they are too light and too speedy for their work if handled by any ordinary driver; but when operated by a careful driver they give good satisfaction. One of these trucks should be rated as of 800 lbs. and the other as of 1200 lbs. capacity.

The two 20 H.P. runabouts were used by the superintendent and the commercial manager, and, owing to the great amount of work under construction, they were on the road day and night, especially as they were often used by the various foremen of the distribution department.

The four low-power runabouts, operated by the complaint and maintenance men, are small chain-drive single-cylinder cars. They have been of great assistance in giving good service at the least expense, allowing our scattered districts to be as well cared for as a more thickly settled city.

The garage force and drivers are of great importance for the welfare and economy of automobile operation. It is very difficult to obtain a good all-round man for the garage. Almost all these men have their specialities. Some are good ignition men, others good machinists and assemblers; some know little about a carburettor, and some little about anything. At one time we had four different garage foremen in as many weeks, owing to our inability to secure a good man at any reasonable wage.

To ensure proper attention being given to our cars by the garage, we instituted a schedule of weekly inspection and monthly overhaul. One half day per week should be devoted to the former; and the latter should not take more than 1½ days. If the weekly inspection and monthly overhaul are done in a thorough manner, a regular overhaul need not be made nearly so frequently, and so more regularity in service may be observed. The inspection is made by the garage foreman in person, who is held responsible for the general condition of all the cars. The drivers regularly assigned to a car are personally responsible for its condition, and they see that it is in good order before taking it out of the garage. A good driver can keep his car always on the road with little expense, while one who is careless can change a truck into a "white elephant" in a very short time.

One great item in an automobile equipment is a delivery system. Without it a truck can waste a great proportion of its time loading and unloading. By having its load ready in boxes for rapid handling, the driver and his helper can spend but little time at stops; then if care is taken in routing it is comparatively easy to get efficient service from the trucks. A good recorder is of material assistance in promoting the delivery efficiency.

One of the important items in motor operation is the cost of tyres. No other part of a car suffers more from careless handling and inattention; and there is practically no reliable check upon a driver's care or abuse. Overloading, speed, road conditions, inflation, and truck design all enter into relations of tyre costs. The nature of the roads and of the service, the weather conditions, and the handling of the car all enter into the estimation of fuel efficiency, whether gasoline or electricity. The useful life of a car is ended when its total annual cost, including all charges, exceeds the total annual cost of a new car *plus* the interest on the investment of the old. The life assumed for a car is, at the best, only a rough guess; for it must be remembered that so many conditions, variable at the best, enter into its consideration.

Replies to questions submitted to a number of New England gas companies indicated that a great many were still using the horse, and many who had automobiles kept no cost record. Drivers' and helpers' wages vary with the locality, from $2 to $3 a day for drivers, and $1 to $2·50 a day for helpers. Some of the gas companies of New England maintain their own garages, while others hand their car over to a public garage.

The author gave a tabulation of the replies received from a number of New England gas companies. The summary showed that but a small proportion of available time was lost by the trucks owing to repairs, breaking, &c. This should be compared with horse delivery, with its days off for lameness, heat, and sickness, shoeing, &c. One company covers more than 85 miles of wires and 55 miles of mains with but two trucks. How many horses would be required to cover this mileage? The replies vary from four horses and waggons to two replaced by one truck. All indicate a saving in time and an increase in work accomplished and ability to give better service. In reply to questions sent out to various companies, asking what depreciation was charged, the various answers indicated a lack of uniformity of depreciation charges, varying from no charge to 33⅓ per cent., as charged by at least two companies.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Tottenham Gasholder Contract.

SIR,—We are one of the Contractors who, in response to the Directors' invitation, submitted a tender for the Tottenham Company's new holder; and as we take emphatic objection to the suggestions implied by your comments on this matter, we beg for space to contradict same, so far as we are concerned.

No individuals other than our own Directors were in any way cognizant of our figures, either definitely or approximately. Nor had we any information as to, or influence over, the tenders of any other contractor.

We have been informed that ours was the lowest tender, other than that accepted—that it was £897 lower than the next above it, £4630 less than the highest English one, and £17,930 lower than the highest of all the tenders—*a foreign one.*

Surely an intelligent appreciation of these figures would, of itself, suggest the improbability of any such ideas as those which you have suggested.

We notice you lay stress on the fact that the cast-iron portions of the work have been specially reserved to this country. But this is of trifling importance. The structure is essentially a steel one—the cast-iron comprising less than 3½ per cent. of the whole.

39, *Victoria Street, S.W.*,
June 6, 1914.

SAM. CUTLER AND SONS, LIMITED.
(SAML. CUTLER, *Director.*)

[We are glad that Messrs. Cutler and Sons have complied with the invitation genuinely made by us last week to the British gasholder builders, to send any explanation for publication, to which they thought fit to append their signatures, regarding the question of the Tottenham contract. Messrs. Cutler are the only firm who have responded: and we shall still be pleased to receive communications respecting the matter from any of the other firms. Let us in the first place make known the fact that we have no actual knowledge as to the names of the British firms who tendered for the Tottenham holder; and we have not asked for them. We are therefore in a position to deal with the matter in quite a general and open manner. The assurance that our correspondents give as to the Directors of the firm being the only persons cognizant of the firm's figures, definitely or approximately, is accepted with the utmost willingness, as is equally the statement that succeeds it. Our correspondents, however, take "emphatic objection" to "the suggestions implied" by our comments of last week, they quote certain figures, and then write: "Surely an intelligent appreciation of these figures would of itself suggest the improbability of any such ideas as those you have suggested." Instead of so writing, we should much have preferred that Messrs. Cutler had stated categorically that, from their inner knowledge of the gasholder business, there is no foundation whatever, in connection with any part of it, for the construction that they themselves have placed upon our article of last week. We invite the firm to do so, seeing that they have used the word "improbability," and because we feel that there would be throughout the industry a very "intelligent appreciation" of such a statement with the signature of such a firm as Messrs. Cutler and Sons at the foot, and still further because it would remove certain notions which we know exist, and which it would be well, if possible, to finally set at

rest. Meantime, we have also to acknowledge the receipt of a private, but not anonymous, communication, placing in our possession certain terms for our information. Only unusual circumstances would induce us to make use of the particulars; but at the same time our correspondent is thanked for his letter.—ED. J.G.L.]

Calorific Power in Relation to Candle Power.

SIR,—The first published record of the calorific values of various towns' gas supply appears in "Field's Analysis" for the year 1913 as you rightly comment upon; and your questioning the wisdom of the publication of these figures, in view of the fact that in the majority of cases they are not subject to statutory enactments, is worthy of consideration, and still more so as, on the face of it, they do not appear to be in conformity with the general experience, which is to the effect that, while there is no exact relationship between calories and candles, the relationship is so close that the value of both rise and fall together—governed primarily by the nitrogen content of the gas and the percentage mixture of carburetted water gas.

Out of the number (16) given in "Field's Analysis" three only are statutorily prescribed. Taking the figures, however, as they stand one cannot but be struck by the wide discrepancy that is exhibited. For instance, in the case of the Gas Light and Coke Company, with 14·35-candle gas, the calorific power when converted into B.Th.U. is shown to be 538 B.Th.U. Next to this we have the Commercial Gas Company's gas, of 14·61 candles, showing 472 B.Th.U. In another instance we have the 17-candle Bradford gas giving 617 B.Th.U. and 18·08 and 18·05 candle gas giving 590 and 570 B.Th.U. respectively.

I only mention these as instancing the wide variations which at present appear to prevail in the calorific value, as related to candles, of various grades of gas, which—from a lengthened experience in dealing with gases of all characters from a few candle power up to 30-candle power—I am prepared to assert is not in conformity with my experience.

It is true we are not informed as to the conditions under which the illuminating power tests are taken, and which necessarily affect these figures; but it may be interesting—in view of the importance of the subject and the approaching meeting of the Institution of Gas Engineers—to comment sufficiently to attract attention to the subject, in the hope that it may be effectively dealt with at the forthcoming Liverpool meeting.

What is really wanted in connection with this subject are accurate records of the illuminating power and the means by which it is tested, as well as the means by which the calorific value is ascertained.

The chemical composition of the gas is also of considerable importance when making comparisons one town with another, as it will be found that what is commonly described as the nitrogen content of a town's gas supply or what, in other words, may be more practically stated as non-combustible gas, varies from 5 per cent. to in some cases exceeding 20 per cent.

I venture to send you a diagrammatic record of tests on London gas—

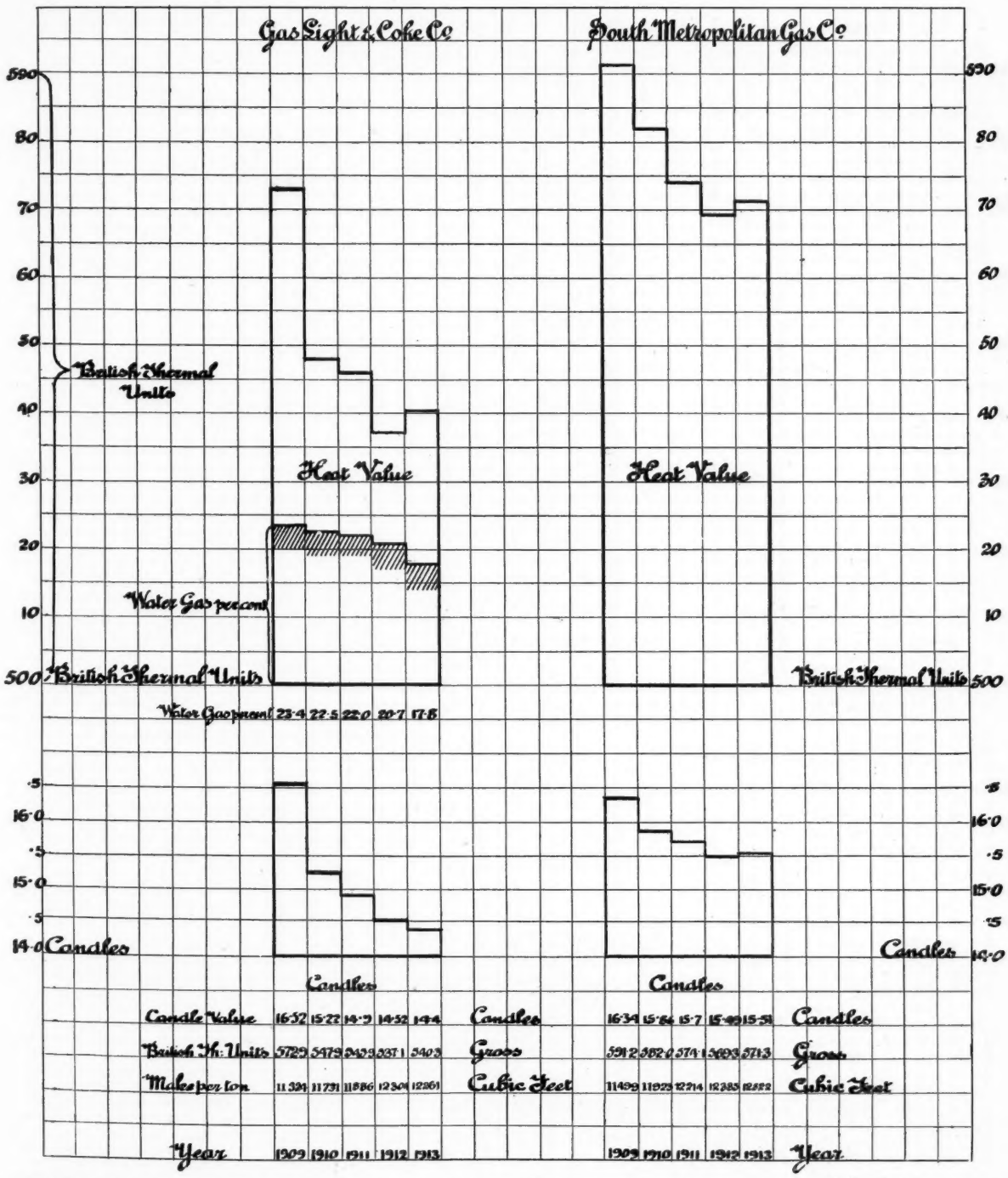


DIAGRAM ILLUSTRATING THE RELATIONSHIP BETWEEN THE CANDLE POWER AND CALORIFIC VALUE OF THE GAS SUPPLIED BY THE METROPOLITAN COMPANIES, AS TESTED BY THE LONDON COUNTY COUNCIL OFFICIALS FOR THE YEARS 1909 TO 1913—PREPARED BY W. R. HERRING.

comparing that of the Gas Light and Coke Company with the South Metropolitan Gas Company—the one being composite gas, the other a straight coal gas mixture.

The diagram deals with the official records for the past five years; and, in the case of the Gas Light and Coke Company, the percentages of carburetted water gas are indicated by a hatched line and figures. It is interesting to note that a reduction in the percentage of carburetted water gas and a reduction in the candle power from 1913 as compared with 1912 shows a slight advance in the calorific value. The South Metropolitan figures are not disturbed by the water gas element; but it will be seen that a 16·34-candle coal gas in 1909 was of considerably higher value than a 16·52-candle coal and water gas, with 23 per cent. of water gas admixture of the Gas Light and Coke Company.

In considering these tables it must be borne in mind that they are the averages of a large number of daily tests, and that averaging often obliterates facts. In the aggregate, however, it must be admitted that the general perspective may be considered true, and is borne out by my own experience over many years now of testing, codifying, and tabulating results of all grades of gas.

In conclusion, allow me to add my congratulations also to Mr. William Blakey, the compiler of "Field's Analysis," for the additional matter he has thought fit to add, which is of a highly useful character, and leads one to expect that still further additions will—as circumstances permit—be added to this indispensable publication.

Palace Chambers, Westminster, June 4, 1914. W. R. HERRING.

The "Cracking" and "Del Monte" Puzzle.

SIR,—Simple-minded members of the British public (especially the automobilists and the "Big Navy" men) are frequently somewhat puzzled when they try to keep abreast of modern progress in the production and manufacture of motor spirit and fuel oil.

Let me cite a recent instance. They buy "The Times," and in their simplicity apply their intelligence (such as it is) to the understanding of a wonderful "cracking" process, by which it seems to be implied that it is a comparatively simple and economically sound thing to convert a heavy crude oil or residue into motor spirit. The simple-minded ones are still lost in wonder at this discovery, when, within a year, they read an advertisement supplement to the "Autocar." Then they waken up, and their slow wits begin to put two and two together—only to find that the sum is certainly not four!

They find it there stated, by an undoubted expert, that by the treatment of Ballycastle cannel by the Del Monte process (whatever that may mean!) there may be obtained, per ton of cannel, 17·4 gallons of motor spirit at 10d. per gallon, and 17·6 gallons of heavy fuel oil at 3d. per gallon. It is further stated that the motor spirit has been prepared by distillation, *cracking* [italics mine], and refining from the first 50 per cent. of distillate.

To the simple ones, it was puzzling that "cracking" should have been applied only to an extent sufficient for the production of 17·4 gallons of motor spirit; while, in view of the confident assertions of "The Times," it should have been easily and economically possible also to convert a large proportion of the 17·6 gallons of heavy fuel oil into motor spirit. The difference between the values of the two products being 7d. per gallon, the simple-minded ones are apt to come to certain conclusions:

First, that the promoters of the "British Isles' Oil Producers, Limited," deliberately desired to restrict their possible profits by at least £13,000 per annum. [This is making the very extravagant assumptions that only one-half of the heavy fuel oil can be converted into motor spirit by "cracking;" and that the cost of "cracking" required for this is equal to the total cost—44d. per ton of cannel—shown, in the estimate of profits, for labour, management, and all refining charges, including "cracking" of the first 50 per cent. of distillate!]

Second, as an inference from the above, that the promoters of the Company are not Scotsmen!

Third, that Mr. W. J. Atkinson Butterfield can impart a delightful tinge of humour (distinctly Scotch) even into an "estimate of profits," by writing "motor spirit" at 10d. per gallon with small initial letters, while writing "Heavy Fuel Oil." at 3d. per gallon, with initial capitals!

The only alternative to the first conclusion would seem, to the simple-minded, to be this: That they could not obtain the extra £13,000 per annum because the thing was not possible, even at the extravagant cost assumed in arriving at this figure, and even on the moderate basis of 50 per cent. of "cracking" efficiency at this cost.

If there is another alternative, that it should be forthcoming from some of the experts, is the earnest wish of at least

June 2, 1914. ONE OF THE SIMPLE-MINDED.

The Late Mr. Newbigging.

SIR,—As an old apprentice of the late Mr. Thomas Newbigging, I would like to write a few lines in appreciation of him as I knew him.

It was my good fortune to receive my engineering training under him on leaving school. During the three years of this training, I ever found him a kind and just master, who was willing at all times to give a helping hand to those who tried to do their duty. Those, however, who put pleasure before business, and who did nothing to improve themselves by study, but spent their spare time in idleness, received no sympathy from him.

Extremely methodical and tidy, just, upright, kindly to his staff, and willing to listen to suggestions from his inferiors, were some of the chief traits in his character. To serve him was a pleasure.

Every member of his staff received from him a presentation copy of each work he published—whether literary or technical.

If at any time we were not fully occupied with engineering work, we helped him with his literary work by writing fair copies from his manuscripts, correcting proofs, &c. In this we saw the same extreme care and precision which characterized all his work. It was quite a common thing to write four or five fair copies of a work before he was satisfied with the phraseology or the arrangement of the sentences.

Since leaving his service, I had frequent opportunities of seeing him at Manchester and Knutsford; and each time there was the same kindly look and sympathetic ear.

On one occasion I sent him a copy of a school magazine containing a short essay on "Art in Music"—my first attempt as an essayist. The kindly criticism which I received from him, who was a past-master in the art of essay writing, is now one of my treasures.

When travelling, Mr. Newbigging carried a small note-book in which he put down ideas as they occurred to him. In a few months these ideas were collected, and eventually appeared as a paper or an essay perhaps for the Manchester Literary Society or the Press.

His noble character was one which should serve as a model for young gas engineers to follow. The training one received from him was not only an engineering training, but a training in character and good conduct in business.

One mourns his loss not only as the loss of a master but of a guide and counsellor.

Harrogate Gas-Works, June 4, 1914. FRANK H. ROBINSON.

The Price of Tin.

SIR,—It has been reported in the "Daily Mail" that the price of tin has fallen below £140 per ton. About two years ago it approached £230.

Apparently, it has been found impossible, by any means, to keep the price up.

May I commend these facts to certain of the firms supplying the gas industry, with a view to inducing them to amend their ways.

Taunton, June 5, 1914. A. EDWARDS.

Value of Well-Lighted Streets.

This is the subject of the first editorial article in the current number of the "Sanitary Record and Municipal Engineering." Our contemporary says: "Well-lighted streets are an asset the value of which it is difficult to estimate with any degree of accuracy. In these days, when every municipality is striving to increase the rateable value of its area *viâ* the medium of new industries, or, if it is suburban, by means of a larger residential population, the lighting of the streets is an important factor. Streets that are well lighted give an impression of a town and people that are 'live;' while ill-lighted streets indicate that one would not fare too well in other services from such an authority. And yet it is beyond dispute that the bulk of the street lighting in this country is far from good; and a large amount of it is 'lighting' in name only. The methods are too cramped—too much the methods of a hundred years ago. When gas was introduced, flat-flame burners, giving 2-candle power per cubic foot of gas, were fixed in square lanterns placed at an absurd distance from each other. But despite the fact that the price of gas has been reduced enormously, and the efficiency of the inverted incandescent burner is as much as thirty times that of the old flat-flame burner, we find in many cases the same lanterns at the same distance apart, and in a few cases with the same burners. In this progressive age, that is a state of affairs that cannot exist for long; and we are glad to notice an awakening to the defects of the present system. It is the duty of everyone who has the control of public lighting to take advantage of the most modern developments in lighting, be it gas or electric." The writer then proceeds to discourse on the advantages of the inverted gas-burner.

Lighting of Melton Mowbray.—The Melton Mowbray Gas Company and the Melton Mowbray Electric Light Company were recently in competition for the lighting of the town for five years, commencing next August. The former Company, who have just completed a five years' contract, were again successful. There are now erected in the town 227 lamps, ranging from 500 to 50 candle power.

Birkenhead Gas Profits.—At the last meeting of the Birkenhead Town Council, Alderman M'Gault, the Chairman of the Gas Committee, reported that the gross working profit, including a transfer of £16,171 from the reduction of price account at 4d. per 1000 cubic feet, was £52,606; loan charges were £18,246; and the amount placed to the borough fund in aid of the rates was £13,398. The balance to the credit of the renewals fund was £32,128.

Satisfactory Results at Cockermouth.—When moving the confirmation of the minutes of the Gas Committee, Mr. Dickson congratulated the members of the Cockermouth Urban District Council on the satisfactory result of the year's operations at the gas-works. He pointed out that the net profit was £308, in spite of the fact that coal cost £400 more. This result reflected great credit on the Gas Manager (Mr. E. D. Wootton), who was well worth the increase of salary which the Committee recommended. The increase was granted by five votes to three.

Chronic Inhalation of Coal Gas.—A verdict that deceased died from pernicious anæmia, caused by the chronic inhalation of coal gas while following his employment, and that death was accidental, was returned by the Coroner's Jury who inquired into a fatality at Prestwich. It was stated that the man had had charge of a gas-engine for two years, and that he often complained to his wife of the smell of gas. Since Christmas he had not been well enough to work. The Manager of the mill stated that sometimes there was a smell of gas from the engine in the morning. The doctor said deceased had his stomach upset, a feeling of lassitude, and dyspepsia; and gradually he got anæmia, which increased. Pernicious anæmia was a well-known disease which was always fatal, and for which the causes were unknown. He thought the inhaling of coal gas had the effect of causing the disease. Until then he had never had or read of a similar case; but he had come across instances of ordinary anæmia due to the chronic inhaling of coal gas. Of course, the disease might come of itself, apart from the coal gas.

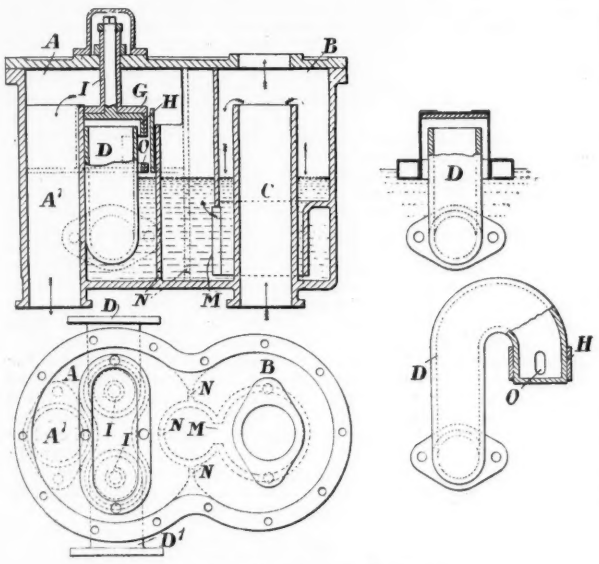
REGISTER OF PATENTS.

Pressure Regulator for Gases under Pressure.

AKTIENGESELLSCHAFT FÜR SELAS BELEUCHTUNG, of Berlin.

No. 9789; April 25, 1913. Convention date, April 25, 1912.

This apparatus is what may be termed a "hydrostatic regulator," intended to preserve a constant gas pressure in the service or delivery main, and also, when a mixture of gases is compressed, to preserve a constant mixing ratio. It is also intended to enable the pressure or the mixing ratio suited to the purpose in view to be readily adjusted, and when once adjusted, to be preserved independently of the volume of gas or gases passing through it.



A Selas Gas Pressure Regulator.

It is seen that the regulator comprises two main chambers A and B. Gas and air are admitted to the chamber A by way of the admission pipes D, D^1, and are conveyed by way of the passage A^1 to the compressor (not shown). The gas and air, after compression, are delivered to the passage C in the chamber B, whence the compressed mixture passes to the service or supply mains. The chambers A and B communicate by a bye-pass pipe open at the top to the chamber A, and open laterally at M at its lower end to the chamber B. The lower end of the pipe also communicates with the chamber A by way of holes N. The pipes D and D^1, after entering the chamber A laterally, turn upwards, and their open ends are surmounted by adjustable hoods. Each hood comprises a bell-like member G adjustable vertically in a gas-tight bearing. Inside the hollow stem I is a spindle (adjustable by means of a nut) carrying a cylindrical valve H having one or more ports for registering with one or more ports O in the member G.

The regulator is mounted upon the compressor, and liquid, such as oil, glycerine, or mercury, is poured into it until the indicated level is reached. If, as has been assumed, the regulator is to be used in the supply of a mixture of separate gaseous fluids, the two hoods are adjusted so that, with rise and fall of the liquid level in the chamber A, the closing and the opening of the mouths of the two hoods take place simultaneously.

The operation of the apparatus is as follows: When the compressor is driven, gas and air are drawn through the pipes D and D^1 into the chamber A, and thence, by way of the passage A^1, into the compressor. The mixture of gases at an increased pressure is delivered to the pipe C, and passes through the chamber B to the supply mains. The delivery pressure of the gaseous mixture acts upon the surface of the liquid exposed to it, and drives some of the liquid through the opening M and the holes N up into the chamber A around the pipes D D^1. This changing of liquid levels continues with an increase of delivery pressure until the level of the liquid in the chamber B is driven down as far as the top of the opening M. The difference in level of the liquid surfaces in the chambers A and B under these conditions shows the maximum delivery pressure of the compressed gaseous mixture.

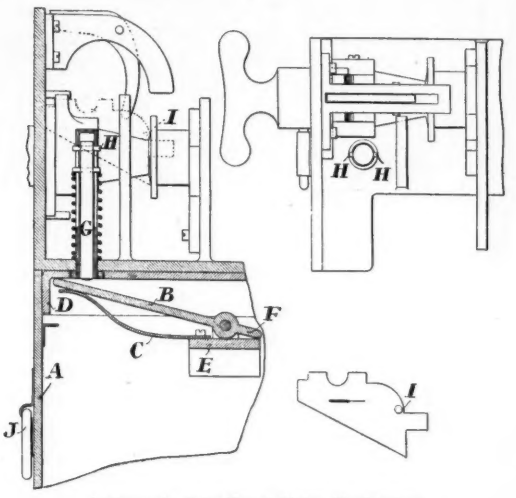
The lower part of the chamber B, commencing at a point slightly above the top of the opening M, may (if desired) be reduced in sectional area by the provision of a downwardly depending internal flange. Naturally, below this point the liquid level is more sensitive to change in pressure; and the maximum delivery pressure is therefore well regulated. In other words, when the liquid surface in the chamber B is forced down to the level of the top of the flange, any further drop in liquid level due to a further increase of delivery pressure is very pronounced, owing to the reduced cross-sectional area of the chamber, and a relatively large portion of the opening M becomes quickly exposed to the compressed gases. Whereupon they promptly escape up the pipe shown, and thus automatically relieve the pressure, and thereby maintain a constant maximum delivery pressure. Simultaneously with increasing depression of the liquid level below the point at which the cross-sectional shape of the chamber B changes, the liquid rises in the chamber A more and more, and thus restricts the admission of gas and air to this chamber.

Coin-Freed Meters.

ANDERSON, J., of Edinburgh.

No. 10,759; May 7, 1913.

This invention relates more particularly to the arrangements for safely keeping the coins which have been inserted until the meter is cleared of them. The invention includes a coin-box locked by a catch and unlocked by the depression of a spring-pressed vertical rod, which is moved downwards, when it is desired to release the coin-box, by means of an opening "blank" or connector bodily inserted into the coin pocket—that is, with no rigid projecting handle.



Anderson's Coin-Freed Meter Mechanism.

The illustration shows a part sectional elevation through the prepayment mechanism chamber and part of the coin-box, and a plan of same; also an opening blank to an enlarged scale.

The patentee provides prepayment mechanism such as that indicated in patent No. 26,278 of 1910; and in the usual container A below same is a strong metal catch B, formed of a pivoted bar with a flat spring C beneath it, so as to keep its forward end in the raised position against the fixed angle piece D. The bar is mounted on a transverse member E securely fixed within the container and near the top of it—the bar also acting to limit the upward motion of the pivoted catch to a sufficient extent by contact with the tail-piece F. The angle-piece D prevents the catch B being forced down so as to release the container by a knife inserted between the top edge of the container and the lower edge of the wall above it.

To release the catch, a spring-controlled rod G projects vertically through the base carrying the prepayment mechanism; and this rod is provided with a transverse pin H to be operated by a properly-shaped blank—say, like that shown. The opener is inserted bodily into the slot through which coins are usually inserted; and the handle is then turned so that the opener forces down the rod and releases the catch, after which the container can be withdrawn by the ring J. After this, by further rotating the coin handle, ths blank drops through the ordinary coin opening. The opener has a pin I on its front end, so that it will not feed forward quite so far as the ordinary coin.

Measuring Gas.

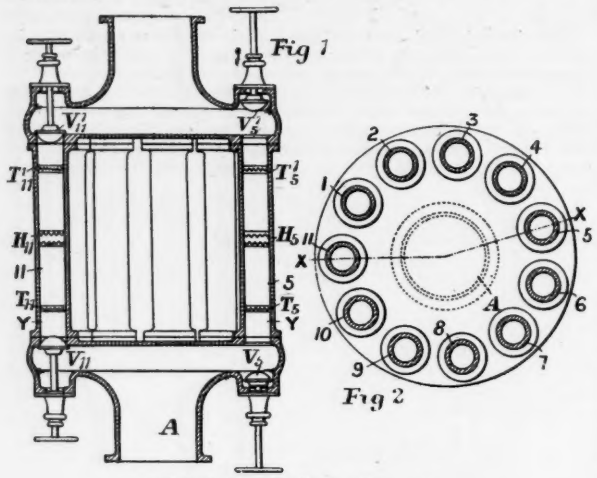
JULIUS PINTSCH AKTIENGESELLSCHAFT, of Berlin.

No. 15,094; June 30, 1913. Convention date, Jan. 30, 1913.

In explanation of their invention the patentees remark: It is not unusual in the electro-technical industry to measure the strength of a current by branching-off a certain portion of the same. Although this method has been employed in the gas making industry, it is inaccurate if gas-meters with moving or rotating parts are employed. A variation of the amount of gas passing through the meter results in the variation of the fall of pressure. Since the fall of pressure in the conduits having no motor-meter varies according to a different law, the result of the measurement is inaccurate. The only possibility of a division of the current would appear to be one in connection with the measuring method disclosed in patent No. 30,405 of 1909—a method based on the principle of heating the gas passing through a conduit by means of a certain amount of heat, and measuring the resulting increase of temperature. In carrying out the method it is only necessary to provide certain fixed apparatus—that is to say, a heating body and thermometers mounted in the gas conduit or pipe or in a shunt to the gas conduit or pipe.

According to the present invention the gas pipe or conduit is divided into two or more branches of equal size, so that special accuracy is attained; and the various branches are rendered entirely independent of any deposits of dust, tar, water, or the like, by fitting a heating body and thermometers in each branch, and by consecutively connecting all the branches, according to the regular system, with the measuring device. The indications of the meter multiplied by the number of branch pipes constitute a reliable record of the total passage of gas through the pipe. In order to avoid any interruption of the measurement, or an inaccurate indication while the branches are being changed, arrangements may be made whereby the measuring devices are not connected with the new branch until the previously connected heating devices have attained their normal conditions. If the closing

means necessary for each pipe are provided, it is possible to clean the branch pipes without having a bye-pass, and without interrupting the measurement.



Pintsch Company's Gas Measurer.

Fig. 1 shows in longitudinal section, corresponding to the line X of fig. 2, one construction of gas-meter embodying the invention. Fig. 2 is a transverse section corresponding to the line Y of fig. 1.

The various branches of the apparatus are indicated by the numerals 1 to 11, and the reference letters employed in connection with these branches are provided with corresponding numeral indices.

The gas enters the branching or distributing device at A and passes, with its current equally divided, through the branches 1 to 10, the eleventh branch 11 being cut off by means of the valves V^{11} and V^{1}_{11}. In these branches there are provided corresponding heating bodies H^{1} to H^{11}, and thermometers T_1 to T_{11} and T^{1}_{1} to T^{1}_{11}.

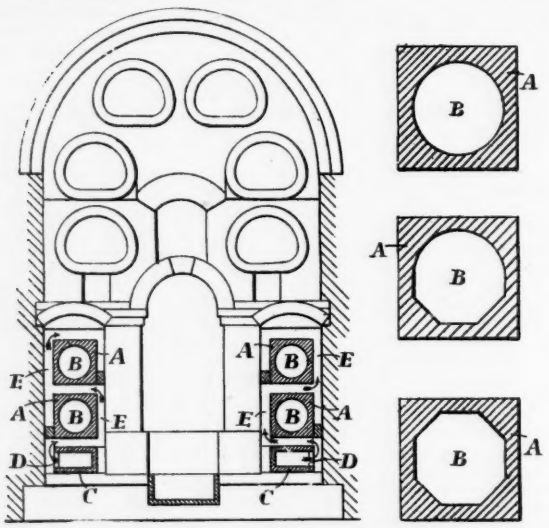
The desired measurement is effected, with the meter in the condition shown, but imparting to the heating bodies H_1 to H_{10} consecutively a certain quantity of heat, and observing the increase of temperature, or by retaining a predetermined temperature difference and measuring the heating energy necessary for the same. The eleventh branch is the one that may be taken out and cleaned.

Regenerative Furnaces.

WALSH, H., and PRIESTLEY, A., of Halifax.

No. 10,950; May 9, 1913.

This invention relates to the construction of regenerators in which the heated air is used for igniting the combustible gases made in the producer, and in which the waste gases pass from back to front and front to back of the furnace horizontally through two or more rows of passages (arranged upon each side of the producer) formed of square tubes or hollow blocks, gradually parting with heat which is absorbed by the secondary air circulating around these tubes in a vertical zig-zag fashion transverse to their length—the arrangement being such that the air never comes in contact with the end walls of the regenerator or producer chamber.



Walsh and Priestley's Regenerative Furnaces.

A transverse section of a regenerative furnace with the improvements applied is shown; also enlarged transverse sections of the regenerator tube or hollow block employed.

The regenerator tubes or hollow blocks A are square externally, with a round or like bore B. This construction is for the purpose of thickening the tube at a point which usually suffers most from heat, and adds strength to the crown of the tube to resist weight or a tendency to collapse. In place of the ordinary perforated partitions an inlet tube C is constructed of rectangular section, with a slit or open side D upon the side of the air-tube opposite to, or adjoining, the entrance to the winding air-passages E, and communicating with it. The supply of air by this tube is regulated, if necessary, by a sliding plate, slab, or damper.

Fractional Recovery of the Bye-Products of Illuminating Town Gas Production.

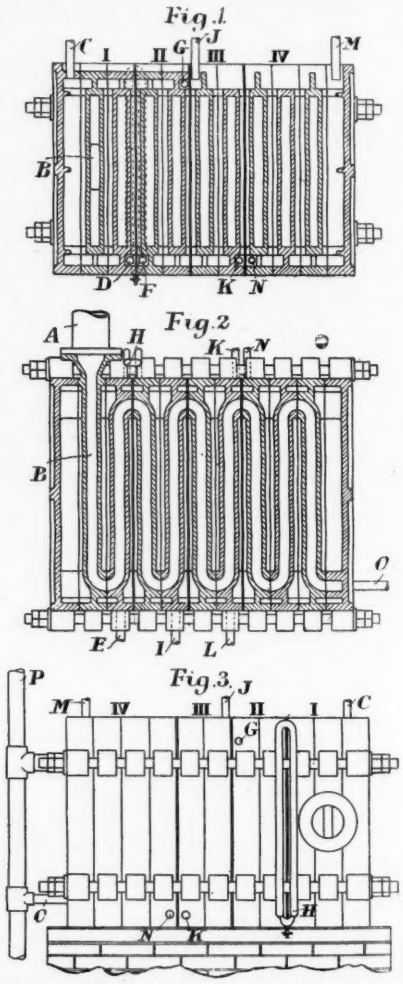
FISCHER, J., of Vienna.

No. 21,290; Sept. 20, 1913.

This invention relates to the recovery of bye-products from the volatile distillation products obtained in the destructive distillation of coal.

The patentee remarks that, in the production of illuminating gas and in coking, a suitable process enabling the bye-products to be recovered separately from each other, and immediately, has been sought. Such proposals have been made in patents No. 20,139 of 1907 and No. 6966 of 1908. In both these processes the bye-products are separated according to their boiling points by successive stepwise cooling of the volatile distillation products. The object of the present invention, however, is "to provide an improved process for the immediate recovery in fractions of the condensable bye-products produced in the destructive distillation of coal by the successive stepwise cooling of the volatile distillation products."

In carrying the process into effect, the condensable bye-products—"by which is meant particularly the bye-products which are liquid or solid at the normal temperature of the air, produced by the destructive distillation of coal and the like, and arising (for example) from the production of illuminating gas or from bye-product coke-ovens"—are immediately recovered, in fractions, by treating the volatile distillation products in hollow plate condensers, through which the distillation products pass in a thin vertical stream. In this manner the condensable constituents are separated one from another according to their boiling points. For the purpose of cooling the volatile distillation products, vapour or air at a temperature suitable for the purpose is advantageously employed in the first compartments of the condenser; while water or other liquid at a suitable temperature is used in the other compartments—the temperature of the cooling medium being adjusted so as to obtain from the several compartments fractions possessing the desired boiling points. In all the compartments of the condenser that are cooled with hot vapour or hot air, a single current of cooling medium adapted to pass through all these compartments is preferably employed, which current, on issuing from one compartment, is reduced to the cooling temperature required for the following compartment by means of a cooling-device arranged outside the condenser.



Fischer's Apparatus for the Recovery of Bye-Products.

The illustration shows a hollow plate condenser for carrying into effect the process according to the invention. Fig. 1 is a vertical section; fig. 2, a horizontal section; fig. 3, a view from the back.

The gases issuing from the retorts or chamber ovens enter through the conduit A into the gas-channel B of the hollow plate-condenser, through which they pass in a thin vertical zigzag stream in a horizontal direction. The cooling chamber of the condenser is divided, according to the number of fractions to be obtained, by sheet-iron plates provided with openings corresponding to the gas-channel, into several compartments I., II., III., IV., &c., each of which contains a cooling agent of different temperature, which is highest in the first compartment and lower in each following compartment.

In the apparatus shown, compartments I. and II. are cooled by hot vapour or hot air, for which reason the cooling spaces of the compartments are closed at the top. In compartment I. the temperature of the cooling agent, which enters through the conduit C and escapes at D, is so high that only the very heavy wax-like constituents of the tar vapours can condense in this compartment. The condensed product is discharged from the hollow plates through the pipe E.

The hot cooling medium issuing at D enters at F into the compartment II., and escapes at G. In order to reduce the cooling medium to the temperature required for the second compartment, it is necessary to cool it prior to its entrance into the latter. For this purpose it passes through a conduit H arranged outside the condenser, or in a receptacle containing a cooling medium and preferably provided with a cock to let off the water of condensation. In the second compartment the temperature of the cooling medium is such that the heavy tar oils are condensed, which drain off through the pipe I.

The compartmant III. is cooled with hot water, which enters through the pipe J and escapes at K. In this compartment the ammoniacal liquor deposits, and escapes through the pipe L.

The compartment IV. is cooled with cold water, which returns through the pipe M and escapes at N. In this compartment the lighter tar oils are condensed, and escape through the pipe O.

In other compartments (not shown) the very light vapours are condensed with the aid of cooling agents at a lower temperature or of a more effective kind. The non-condensable gases escape through a pipe P, and are led away to be used or treated as desired.

The patentee claims that, "by the process and by the apparatus described, with a considerable degree of convenience the condensable bye-products contained in the volatile distillation products may in one process and at once be obtained separately from one another—any desired number of fractions being obtained by suitably selecting the number of the cooling compartments and cooling temperatures."

Time-Controlled Gas Lighting and Extinguishing Apparatus.

GUNNING, J., of Bournemouth.

No. 21,765; Sept. 26, 1913.

This invention relates primarily to street lighting apparatus of the type in which the supply of gas to the lamps is automatically established and cut off at predetermined times by the operation of clockwork mechanism, the time-disc of which is provided with adjustable tappets which co-operate with a cock or valve in the gas-supply pipe—the apparatus being similar to that described in patents No. 8862 of 1908, No. 23,448 of 1910, and No. 24,707 of 1911.

The present invention consists in improvements in the construction and arrangement of the associated parts of the supply cock or valve mechanism, and the disposition of these parts relative to the clockwork mechanism, whereby apparatus of this character will be more readily accessible for purposes other than those incident to its normal working, and in particular for the purposes (1) of more easily cleaning or lubricating the plug of the gas-tap; (2) of enabling the tap to be turned at will, independently of the operation of the timing mechanism; and (3) of more easily removing the timing mechanism or controller for the purpose of repairing or replacement, without interfering with the gas-tap and connections.

Direct Recovery of Ammonia from Coal Distillation Products.

CARL STILL COMPANY, of Recklinghausen, Germany.

No. 28,245; Dec. 8, 1913.

This is a further development of the invention described in patent No. 28,072 of 1912 "as a process for the direct recovery of ammonia from the products of the destructive distillation of coal or the like."

As described in the patent, the recovery of ammonia from the gases evolved during distillation was to be accomplished by initially cooling the gases by means of a continuously circulating quantity of water or liquor brought into direct contact with the gases, which latter, after passing through an intermediate cooler, were reheated by means of the water employed for the initial cooling to a certain degree, whereupon the ammonia was neutralized with acid in the usual way.

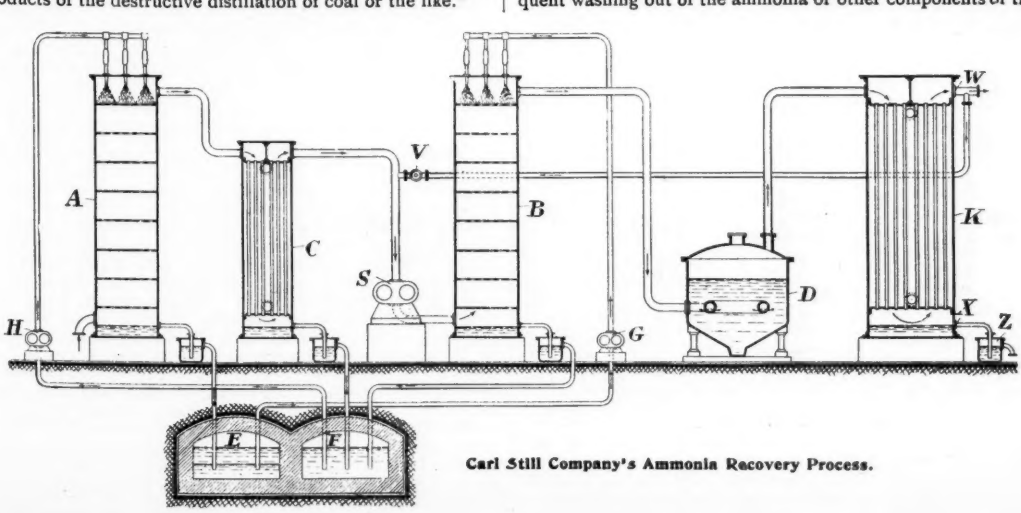
The present invention is characterized by a certain volume of the gases, which have been deprived of their ammonia content in the saturator, and, finally, cooled down to a temperature suitable for their further use, being reconducted to the main gas current, which they enter at a suitable position between the two stages of direct cooling and reheating. By these means the volume of gases to be reheated is said to be correspondingly augmented, and, similarly, their capacity for saturation with aqueous vapours is enhanced; "and thus the gases will more easily carry the required quantity of water."

A is the column used for the direct cooling, and B that for direct reheating of the gases; C is the intermediate cooler; and D the ammonia saturator. E and F are the tanks for collecting the liquids flowing from A and B respectively. Between B, employed for reheating the gases, and the intermediate cooler C, a gas-exhauster S is provided, which serves for imparting motion to the gases within the plant. Behind the ammonia saturator D an additional final cooler K is arranged.

The gases are impelled successively through the direct cooler A, the intermediate cooler C, the direct heater B, and the saturator D, by means of the exhauster S, whereby they are first cooled, and then reheated in A and B respectively by means of a continuously circulating quantity of water or liquor according to the earlier patent. The gases which pass from B to D in a heated condition escape from the latter, with a slightly higher temperature, through the pipe between D and K, and enter the final cooler K, in which they are cooled down to a temperature suitable for their later use. During this final cooling, the aqueous vapour present in the gases is condensed, and the condensate flows out into a seal-pot. The cooled gases leave the cooler K through the pipe-main W. From the latter a return pipe-main is branched off which is in connection with the suction main of the exhauster S, and is provided with a regulating valve V. By this arrangement, a continuous sream of cooled gases can be drawn through the pipe-main between V and W, suitably regulated by the valve V, and can be reintroduced into the main current of the gases. By these means the volume of cooled gases entering the heater B is augmented in any desired proportion. Generally the volume of cooled gas reintroduced into the system which will suffice for the purpose corresponds (approximately) to about half to the whole of the gases originally entering the process.

A further advantage is said to be secured in this process by raising the temperature of the subsidiary stream of gases, reconducted through the pipe-main, to a certain degree—preferably not in excess of the final temperature of the gases at the exit to the heater B, wherein they have been reheated. This can readily be accomplished by utilizing the heat of the hot crude gases or that of the finally treated gases before their final cooling in the cooler K, by leading the pipe-main for a certain distance inside the suction main in which the hot crude gases from the ovens are conducted to the condenser A, or by using the heat contained in the gases after leaving the saturator D for a preliminary preheating, or even for the complete heating of the subsidiary stream before it is influenced by the temperature of the hot crude gases. By these means a certain amount of heat is conveyed to the evaporator B by the subsidiary stream of gas, and coincidently the vaporization of water and the capacity of the gases for moisture saturation is still further enhanced. With this method of raising the temperature of the subsidiary stream of gases, the heated gases are not admitted to the main stream before it enters the evaporator, but at a point approximately in the middle of this apparatus, in order that the temperature of the main stream of gases previously conducted through the intermediate cooler C is not again raised immediately afterwards by the admission of the heated subsidiary stream at the point where the circulating water must run off as cold as possible, and the cycle of operations thus disturbed.

It has already been proposed to cool gases resulting from the distillation of coal for the purpose of separating out tar, and to mix these gases, being in a state of water saturation, with an additional volume of purified gases of the same nature but of lower dew-point; and it has also been proposed to heat preliminarily this admixture gas having a low dew-point to a degree of temperature predetermined and regulated at will in order to adjust the new "dew-point" of the gas mixture so formed—thereby in both cases attaining the object that in the subsequent washing out of the ammonia or other components of the gas any



Carl Still Company's Ammonia Recovery Process.

disturbance caused by the condensation of water from the gases is avoided. In the process, however, which forms the subject of this invention, the alteration of the original dew-point of the gases by means of the admixture of other gases is of no importance, as the object of the invention is to impart to the gases to be treated an increased capacity for absorbing water by means of admixing to the main stream of gases a subsidiary stream of the same gases, which latter may be at the point of admixture of the same or a higher temperature—thus enabling the gases to absorb and to carry away with greater certainty a fixed quantity of water in the form of vapour during the subsequent direct reheating.

The reintroduction of a subsidiary stream of the completely treated and cooled gases into the main gas current, both with and without reheating, according to the present invention, is claimed to be an important and advantageous improvement of the original process described in the patent No. 28,072 of 1912. In consequence of the increase in the volume of gases entering the heater B, the temperature at which they can take up the aqueous vapour condensed in the initial cooling in the direct cooler A can be reduced; and this lower final temperature of the gases is obtained with greater facility by the direct action of the heated water on the gases in the heating column B. Thus the requisite degree of saturation is more easily attained at this stage of the process, with additional security for the proper cycle of operations. The diminution of the final temperature of the reheated gases offers other advantages. Firstly, heat losses by radiation in the reheater B, and thereby in the whole process, are obviously reduced. This reduction in heat losses is an advantage to the complete process, specifically based upon the entire utilization of the heat carried by the crude gases, which is transmitted by the water or liquid continuously circulating, and successively used for cooling and reheating, from the cooler A to the reheater B. Besides, the working temperature of the saturator D is reduced in consequence of the lower inlet temperature of the gases. Thereby, according to the lower degree of saturation in the gases, the tendency of the aqueous vapour to condense in the saturating bath from the gases and so act as a diluent is diminished. In addition, "it is possible to operate with less free acid in the bath, and the ammonia salt is purer and of greater value in consequence."

Gas-Burners.

WINN, P., of Birmingham, and WILKES, A. H., of Four Oaks, near Birmingham.

No. 22,280; Oct. 3, 1913.

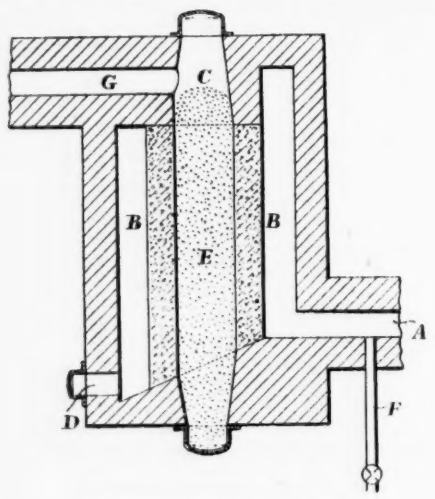
The claims for this invention are: (1) In inverted gas-burners the application of a swing joint to the upper portion of the regulator chamber; the joint being of the ball type and always having metal bearing surfaces in contact. (2) A gas-regulator chamber having at its upper portion a swing joint connection with the supporting fitting—the connection being of the ball type, and the regulator chamber having direct connection with the burner-tube, in the upper part of which tube, or in an extension of the regulator chamber, are air inlet openings without any mechanical regulating devices. (3) A gas-regulating chamber having a cup or ring at its upper portion and a connection-piece having a half ball engaging the cap or ring, with air inlet openings in the walls of the burner-tube or in the regulator chamber below the gas-passage of the regulator.

Purifying Apparatus for Generator Gas, Water Gas, &c.

BERLIN-ANHALTISCHE MASCHINEBAU-AKTIEN-GESELLSCHAFT, of Berlin.

No. 28,389; Dec. 9, 1913. Convention date Dec. 11, 1912.

This invention relates to purifying apparatus for separating soot, dust, and sulphur compounds from generator gas, water gas, and the like—"characterized by a retort-like vessel adapted to receive iron turnings or pieces of metal suitable for combining with sulphur, and made of a porous material, being arranged in a casing which protects the hot generator gases from losses of heat, and by air being supplied, if desired, in adjustable quantities to the hot gases admitted."



A German Water-Gas Purifier.

A construction of the purifier is shown in longitudinal section. The gas passes through a pipe A into the purifier, and fills the annular space B. Centrally within the purifier is arranged a retort-like vessel C, the wall of which is made of porous material. It is closed air-tight at either end by "Morton closing devices," through which iron turnings are introduced, and after being saturated with sulphur compounds are again discharged. The gas filling the annular space B is forced to pass through the porous wall of the vessel C, which holds back the soot carried from the generator, so that it collects at the bottom and can be removed through a cleaning opening D closed gas-tight. Within the vessel C, the gas comes into contact with the hot-iron turnings E, and gives off to the latter its sulphur compounds.

In order to raise the purifier to the required temperature quickly when starting, and also to maintain its temperature during working at the high level required for the combination of sulphur with the iron shavings, the space B is further provided with an air-pipe F coming from a blower and opening near the mouth of the conduit A. From the vessel C, the gas passes in a purified state into the conduit G, and from the latter into the reducing vessel, which is preferably arranged immediately behind it.

Safety Device for Controlling the Gas Supply to Bunsen Burners.

HAAN, I. DE, of Amsterdam.

No. 26,625; Nov. 19, 1913. Convention date, Nov. 20, 1912.

This invention relates to a safety device for bunsen burner gas-rings and the like, so as to prevent accidents when the flame of the burner flashes-back into the mixing-tube. The gas inlet pipe is often heated to such an extent by this flashing-back that the rubber tube melts off and the escaping gas is ignited by the flame in the mixing-tube; and to prevent this a spring-operated valve held by a wire has been provided to shut off the gas as soon as heat is generated by the gas flashing-back and melting the wire.

The invention is also based upon the principle of using the heating of the mixing-tube by the back-flash; but in the present case an element is expanded by the heat, which causes a second element attached to mechanism to move under the influence of a tensioned spring or the like—the mechanism shutting off the flow of gas by closing the cock.

APPLICATIONS FOR LETTERS PATENT.

12,790.—HANSFORD, J., "Gas meters." May 25.
12,816.—PALMER, H., "Gas-griller." May 25.
12,818.—DR. C. OTTO & CO., G.M B.H., "Separating tar and ammonia from gases." May 25.
12,840.—WINTERFLOOD, J., "Gas-tap." May 25.
12,851.—PODMORE, A. E., "Gas-burners." May 25.
12,863.—MUIRHEAD, J., "Controlling the flow of fluid in pipes." May 25.
12,877.—PEASE, E. L., "Generation, transference, and utilization of heat." May 26.
12,917.—TOUSSAINT, A. J., "Gas-stoves." May 26.
12,969.—PRICE, C. F. & R. W., "Gaseous muffle." May 27.
12,971.—DOLLMAN, H., "Jointing pipes." May 27.
13,082.—MORGAN, C. E., NEWMAN, W., and MORGAN, W. G., "Joining pipes." May 28.
13,093.—BARRALET, T. E., and the PARKINSON STOVE COMPANY, LTD., "Water-heaters." May 28.
13,109.—LLOYD, E., and the SIMON-CARVÈS BYE-PRODUCT COKE-OVEN CONSTRUCTION AND WORKING COMPANY, LTD., "Treatment of coal gases." May 28
13,127.—LOSSAU, L. VON, "Liquid meters." May 28.
13,130.—JULIUS PINTSCH AKT.-GES., "Inverted lamps." May 28.
13,211.—WELSBACH LIGHT COMPANY, LTD., and BAKER, T. T., "Mantles." May 29.
13,215.—BRITISH GRAETZIN LIGHT, LTD., and MEADS, H. J., "Gas-lamps." May 29.
13,216.—EWART, J. W., "Petrol-air gas." May 29.
13,218.—BANCROFT, F. J., and HANSFORD, J. B., "Charging gas-retorts." May 29.
13,266.—SOUTH METROPOLITAN GAS COMPANY, LTD., and CHANDLER, D., "Gas-ovens." May 29.
13,317.—GOVAN, A. A., "Attaching turbines to water-mains." May 30.

Wigan Gas Undertaking.—The profits on the Wigan Corporation gas undertaking in the past financial year amounted to £9708; and out of them £2000 has been placed to the reserve fund, which has been in operation only one year, and a like sum applied to the relief of the rates. In the previous year the profits were £12,848; and, as in other cases, the reduction last year was due to the increased cost of coal and oil, and the smaller amount received for residuals.

Hygienic Value of Gas-Fires.—At the Bury (Lancs.) Town Council meeting last Thursday, Mr. S. Kay reported that the municipal gas undertaking had made a profit of £5130 on the year's working. This profit was not, he said, so much as in the previous year; but, taking exceptional circumstances into consideration, it was very satisfactory. The quantity of gas sent out during the year showed a slight increase—a fact that was very remarkable when one considered that the growing competition of the Electricity Department was beginning to affect the Gas Department, and also that all the public lamps in the town were now fitted with incandescent burners, which brought about a very great saving. The gas sold to private consumers was more than in the previous year, chiefly because of the greater use now being made of gas fires, cookers, and grillers; and the increased demand for gas-fires particularly was having its effect upon the atmosphere of the town. The Committee had during the year tried the experiment of letting-out gas-fires on the hire-purchase system; and it had proved very successful. For private purposes, the gas had been sold at 1s. 11d. net per 1000 cubic feet, and for commercial purposes at 1s. 5d. to 1s. 9d.; while during the coming year it would drop to 1s. 3d. for the large consumers.

LEGAL INTELLIGENCE.

A POINT UNDER THE WORKMEN'S COMPENSATION ACT.

At the Thetford County Court, last Thursday, his Honour Judge Mulligan, K.C., delivered judgment on an application, in the case of Stinton *v.* Brandon Gas Company, to record an agreement under the Workmen's Compensation Act which raised a point of importance to insurance companies and their solicitors. On Feb. 1, 1912, Mr. John Stinton, formerly the Gas Company's Working Manager, was awarded 19s. a week in that Court as compensation for the loss of a leg. [The case was reported in the "JOURNAL" the following Tuesday.] The weekly payments were made up to March 20 last. Then the Insurance Company arranged to redeem them for £474 7s. 11d.; being the full sum prescribed by the Act. The terms were embodied in an agreement dated March 20, which contained a receipt for the lump sum and a release from all further liability under the Act. The sum was paid to Mr. Stinton, and the agreement was executed by him on the same day. It was then presented to the Registrar to be recorded. As the lump sum had already been paid to Stinton, the Registrar referred the matter to Judge Mulligan at the April Court. His Honour read the agreement; and as it was alleged in the correspondence that similar agreements in like circumstances had often been recorded elsewhere without objection, he ordered the application to be adjourned and placed in his list for argument. The attention of the Solicitors for the applicant and respondent was drawn to Popple's case in 1912 (2 K.B., 141). The Insurance Company still contended that the agreement should be recorded. Their Solicitors referred their Counsel to the case cited; but his view was that the remarks of the Master of the Rolls and Lord Justice Buckley "should be confined to a memorandum dealing with a weekly payment." His Honour said he could not accept this view. Lord Justice Buckley had formulated the peculiar statutory essentials of these documents, one of which was that the agreement must be a subsisting one, "under which either arrears or future payments are or may become due." The agreement in the present case was a mere history of a payment that was made, and did not satisfy the condition named. Nothing was or could ever become due, and no execution could ever issue under it. It was not for the Court to attempt to limit the generality of the proposition to memoranda dealing with weekly payments, as suggested on behalf of the Insurance Company, and the application must be refused.

Claim against a Gas Company.

At the Isle of Wight County Court, last Wednesday, an action was tried in which the Wootton and District (Isle of Wight) Gas Company were sued by the Isle of Wight Central Railway Company for £8 14s. 7d. for excavating and re-filling a trench for a gas-main laid by the side of the railway line, between Haven Street and Wootton, from the small gas-works at Haven Street for the acquisition of which the Company was incorporated about a year ago. Mr. C. F. Hiscock (for the plaintiffs) said that at defendants' request the plaintiffs undertook to excavate a trench and fill it in again after the Gas Company had laid a main therein, for £7 10s. The Gas Company found they were wrong in their levels, with the result that some of the pipes were not laid in the trench, but on the ground above. The Railway Company carried out their undertaking; and the defendants tested the main, raising no dispute whatever until pressed for payment. Mr. F. Hawkyard said he was Managing-Director of the Gas Company, and made the agreement verbally with the Manager of the Railway Company. The Gas Company were not in existence till June 2 last year, so that they could not be liable for work done a week before. For a considerable distance the pipes were bare, with the result that they expanded under the heat of the sun at day and contracted at night, and the weakest joints gave way. He stipulated that the pipes should be laid with a fall for drainage. His Honour Judge Gye (to Mr. Hawkyard): You brought all the trouble upon yourself through not having the thing in writing. Mr. G. Hawkyard (a son) said that he had examined the work, and there were considerable lengths uncovered. Cross-examined: He was Secretary of the Gas Company, and also a Director. He was 19 years of age. There was another shareholder; and the three of them called themselves the Wootton and District Gas Company. The capital of the Company was £2500. He himself held 200 shares, which were given to him. The other shareholder had one share, which was probably given to him. The remaining shares were not taken up. He denied that the Company was a bogus one; and his father said they could get the money to pay when the contract was completed. His Honour: Judgment for plaintiffs for the amount of the claim within seven days.

A Jersey Libel Case.

Much interest is being taken locally in a libel case which has already been before the Jersey Royal Court on several occasions. A Committee elected at St. Heliers to study the electric lighting question are suing the Editor of the "Evening Post;" a sum of £1000 damages being claimed, in addition to an "honourable apology," and the public retraction in the paper of the "calumnies published therein." Certain notes, articles, and correspondence had been published which plaintiffs contended accused them of a "want of frankness and incapacity," and, moreover, that they had forced the inhabitants of St. Heliers to accept electric lighting despite themselves. Suggestions were made in the course of the hearing that tenders had been altered after they had been sent in; but it was pointed out that the chosen tender was accepted on the recommendation of Mr. Preece. The defendant replied that he in no way wished to attack the members of the Committee. He had a perfect right to accuse them of incompetence or carelessness, but could not, and did not, accuse them of dishonesty. The Court, before pronouncing on the legal points raised, accepted defendant's offer to prove that what was published was simply a statement of the truth. It was added that if there was an allegation of "graft," the Judges would deal with it.

MISCELLANEOUS NEWS.

THE NEW VERTICAL RETORTS AT WEST BROMWICH.

Town Council Discusses Serious Difficulty.

On Wednesday last, at a meeting of the West Bromwich Town Council, the Chairman of the Gas Committee (Mr. Brockhouse) mentioned that they had been putting in a new installation of vertical retorts at the gas-works, but in regard to them they had been most unfortunate. They were not yet getting the benefits from the money spent on them that they should have been receiving. Through some unfortunate occurrence with three of the settings, which the Contractors themselves could not account for, the whole installation had not yet commenced working. Eventually he believed things would come right; but at the same time the Committee and the town were losers through the difficulty which had arisen. The Town Clerk had been instructed to write to the Contractors, and they were doing all they could in the matter; but he (Mr. Brockhouse) was disappointed that they had so far derived no benefit from the vertical retorts.

Alderman BLADES said the retorts up to the present had not been satisfactory; but the Committee were hoping they would soon get over the difficulty, and would then have all the advantages of the new installation. The gas undertaking was terribly over-capitalized, but that was nothing to do with the present reduced profits.

Mr. HALFORD thought that they should make it perfectly clear that the Contractors (who were a most honourable firm) were doing their best and at all costs to put things right. It was a small engineering difficulty that had caused the trouble, and no blame whatever was attached to the Contractors.

Alderman J. LAWLEY said it seemed to him that the reasons given for the reduced profits were the same as in other places where handsome profits had been made out of gas undertakings. He noticed that Smethwick had handed over the handsome sum of £6000 towards the relief of the rates, and even Oldbury had given a considerable amount for the same purpose.

Mr. KENDRICK felt that the Gas Committee went too far in reducing the price of gas, and they did not consider the increase in the cost of coal. Smethwick had been able to make such a profit because they had their vertical retorts in proper working order.

Mr. BATES thought the past year's record of the gas undertaking was very unsatisfactory, and they should have made a larger profit on a capital expenditure of £240,000. He suggested that the Committee should consider the advisability of raising the prices for motive power purposes; and he did not think they should sell gas to manufacturers at such a small margin of profit. He inquired who was bearing the cost of putting the vertical retorts in proper working order—the Council or the Contractors.

Mr. BROCKHOUSE said they expected the vertical retorts would be in working order by January; but now they were in June, and they were not ready yet. He was afraid they would have to take the Contractors to task over it. In fact, he had put it plainly to them by suggesting they should give them interest on their money. The Contractors (Messrs. Woodall and Duckham, Limited) would put the vertical retorts in order, and it would not cost the Gas Committee a single penny. But what the Committee complained about was the loss they were sustaining in not having the vertical retorts at work.

LINCOLN CORPORATION GAS UNDERTAKING.

The Past Year's Working.

In moving the adoption of the minutes of the Gas Committee at the meeting of the Lincoln City Council last Tuesday, the Chairman (Alderman Wallis) said that two months ago the Committee offered to give £5500 towards the relief of the rates; and he was glad it had been possible to grant this sum and an additional £250 for the purpose. The gross profit for the year amounted to £15,569, against £15,093 in 1912-13. From this sum had been met the sinking fund and interest charges, amounting to £7647, compared with £7677 before; leaving a net profit of £7922, against £7416 in 1912-13—an increase of £506. The expenditure for the year showed an increase of £1236; the two items mainly responsible being the increased cost of coal (£2478) and the decrease of £1847 in the cost of maintenance of works and plant. The balance was accounted for by small increases in the maintenance charges under various heads. The income was £1712 more than before; £927 being in respect of gas sold and £677 for residuals. The reserve fund showed a credit balance on March 31, 1913, of £9359; and adding the present year's receipts (£684) to this amount, there was a total of £10,043. Out of this sum, however, a grant of £500 was made towards the cost of the Wickham Gardens; thus leaving a balance of £9543. The reserve fund consisted of £3223 invested in Bank of England stock, and £6320 cash at bank used as a working balance. The Council would therefore see that they had nearly £10,000 in reserve. He hoped they would reach this sum next year, when he thought it would be time to stop. For the first time they had exceeded 400 million cubic feet of gas—an increase of nearly 13 millions on the previous year. The capital expenditure had amounted to £241,758 (£49,227 having been met out of revenue); and the outstanding loans amounted to £123,511—showing a surplus on this account of £118,247, compared with £113,744 last year—an increase of £4503. There were 436 more consumers of gas in 1913-14 than in 1912-13; and there was an increase of £607 in the receipts from gas-stoves on hire. They had spent £1454 on new cookers; this being provided out of the profits. A sum of £334 for the extension of mains had also come out of the profits, as well as £654 for new meters, and £400 towards the Boultham swimming baths. After paying all expenses, they had brought forward £1367—a handsome result indeed. The prospects for 1914-15, however, did

not look so bright. They knew not what the price of coal would be, though, of course, they hoped for a reduction. It was evident there would be a great falling-off in residuals; so that next year would not be very bright, and he was afraid there was little hope of reducing the price of gas. The ratepayers must not reckon upon receiving anything towards the relief of the rates next year; but it was hoped that the price of gas would not be raised. At present they had gas at a very low figure; and it was pleasing to see that they had succeeded in getting a fresh supply of 500 tons of gas oil, of which 150 tons were to be taken during the next three months, and the rest after the expiration of the present contract, but not later than Dec. 31, 1915. The Manager (Mr. John Carter) had been authorized to purchase from the Company such additional quantity of oil as might be required for consumption by the date named. They had obtained this oil at almost as low a price as they had ever done. The accounts were adopted.

ST. HELENS GAS UNDERTAKING.

Satisfactory Results—Rate Relief v. Cheaper Gas.

At the Meeting of the St. Helens Town Council last Wednesday, the minutes of the Gas Committee were submitted. Some figures relating to the result of the working in the past financial year were given in the "JOURNAL" for the 19th ult. (p. 526).

Alderman CROOKS, in moving the adoption of the minutes, said the Committee recommended that £3500 from the net profits should be devoted to the borough fund; and, after meeting interest and sinking fund, and paying for the purchase of meters and stoves, the balance of £2050 had been devoted to clearing off items on capital account. The total make of gas was 555 million cubic feet—an increase of 32 millions on the preceding year, and a record for the undertaking. The work of the lighting department had cost £4774, which was £418 less than before. The total reduction of expenditure in the department had been close upon £3000 per annum, saved from the amount raised from the rates of the borough two years ago. During the year the whole of the gas had been sold at a reduction of 2d. per 1000 cubic feet. This affected the profits by nearly £3000; and coals and residuals reduced them by a further £3500. The sale of gas brought in £49,494, and of residuals £27,756; and the total wages paid by the gas and lighting department came to £17,015.

Mr. FRANCIS moved, as an amendment, that it be an instruction to the Gas Committee to make the necessary arrangements forthwith to enable gas to be sold at cost price. He remarked that during the five years he was Elective Auditor he year by year advocated that gas should be sold at cost price. Making large profits and using the money to reduce the general rates acted unfairly to the poor people, and gave large manufacturers a distinct advantage. Three firms in the town who paid about one-fifth of the rates received in relief no less than £1200; but if the gas had been reduced in price they would have received only £470.

Mr. FORSHAW seconded the amendment, and said he knew of a firm in the town which was saved £50 on the rates, and they never used a pennyworth of gas; and he suggested that the Chairman of the Committee should undertake to consider the proposal next year, when it was quite possible that the borough would have some relief from the National Exchequer.

Alderman CROOKS said he would be pleased to do this.

The minutes were then passed.

SOUTHPORT CORPORATION GAS UNDERTAKING.

The Services of Mr. John Bond.

A number of members of the Southport Property Owners' Association visited the Crowlands last Thursday, and inspected the principal portions of the undertaking, under the guidance of Alderman Trounson (the Chairman of the Gas Committee), Mr. John Bond (the Engineer), and others. In the course of a brief speech, Mr. Trounson told the visitors that what they had seen that day would provide them with a good deal of food for thought. Alluding to Mr. Bond, he said that in all probability this gentleman would shortly have bestowed upon him the "Blue Riband" of the gas industry. He therefore took the opportunity of saying, on behalf of the Gas Committee and the ratepayers of the town, how deeply they appreciated the honour which it was proposed to confer on their Engineer. Several speakers referred in eulogistic terms to the services of Mr. Bond to the Municipality.

In acknowledging the compliment, Mr. Bond said the ratepayers would doubtless be pleased to know that the gas estate during the last ten years had handed over for the relief of the rates £130,000. Besides this, prior to the erection of the vertical retorts the Corporation Gas Committee expended over £32,000 on alterations and improvements, the whole of which money had been taken out of revenue; and during the last ten years, though they had made very extensive alterations, not one penny had been put to capital account. They had had, however, very large demands for cookers and other appliances; and it had been necessary to place to capital the sums spent in this direction. They would be pleased to know that in two months the department let out on hire-purchase or simple hire no less than 1000 gas-fires. It was hoped to materially increase the output of gas in the future.

The biennial congress of the National Union of Gas-Workers and General Labourers was held at Sheffield last week, under the presidency of Mr. J. R. Clynes, M.P. At the concluding meeting on Wednesday, Mr. Will Thorne, M.P., was re-elected General Secretary for the twenty-sixth year in succession.

Davis's "ECLIPSE" Boiler.

(MADE IN FOUR SIZES.)

A Self-contained cast-iron Boiler, delivering hot water in less than ten minutes of lighting the gas—extremely accessible—highly efficient.

FITTED with Improved "RAPID" Thermostat—positive in action within a small margin of temperature change—with no delicate parts to get out of order.

Samples will be ready shortly, and if you test the "Eclipse" you are certain to adopt it.

THE DAVIS GAS STOVE CO., LTD.
59, Queen Victoria Street, London, E.C.

A GLASGOW EXPERIMENT IN SMOKELESS FUEL.

The Gas Committee of the Glasgow Corporation have decided to recommend the Council to accept an offer by Mr. R. Maclaurin to erect, as an experiment, at a cost of £400, at one of the gas-works, plant capable of dealing with 20 tons of coal per day, for the manufacture of a smokeless fuel. It is also recommended that it be remitted to the Special Sub-Committee in charge of the matter (*a*) to negotiate with Mr. Maclaurin as to the terms and conditions which he is prepared to grant to the Corporation in the event of them desiring to erect installations of his plant at the gas-works; and (*b*) to see the work carried out in connection with the experiment now proposed to be made. The recommendation of the Gas Committee will come before the Corporation at their meeting to-day (Tuesday).

In the Maclaurin process referred to, the unit plant is supposed to be capable of dealing with a ton of coal per hour—the heat necessary for carbonizing being generated internally. If the experiment bears out the claims of the inventor, a very important advance in coal distillation will have been made, says the "Glasgow Evening Despatch." Apart from yielding a smokeless fuel, the process, if successful, will be of great advantage. The amount of sulphate of ammonia anticipated is double that at present yielded in carbonizing retorts; and instead of 10 gallons of coal tar of low value, a yield of 20 gallons of oil is hoped for with the same yield of gas per ton of coal carbonized.

Mr. Maclaurin, the inventor, is a Glasgow-trained chemist, whose antecedents have been connected with the Scottish oil industry. His grandfather, Mr. James Napier, at one time a chemical manufacturer in Glasgow, was associated with Mr. James Young, the founder of the shale oil industry in the "sixties" of the last century.

WEST BROMWICH GAS UNDERTAKING.

Chairman and Causes of Reduced Profits.

At a Meeting of the West Bromwich Town Council last Wednesday, the Chairman of the Gas Committee (Mr. J. Brockhouse) referred to the annual report of the gas undertaking, which he said everyone would admit was rather disquieting reading. There was apparently a great reduction in the amount of the profits in connection with the undertaking, which required some explanation. The gross profit for the year was £10,193, or £2914 less than the previous year; and the net profit, after charging interest and sinking fund, was £1238, or a reduction of £3585. It was only to be expected that the Council should know how this reduction was accounted for. Taking the income first, he pointed out that the total income was £62,442, or £348 less than the previous year. Although there was an increase of 7½ million cubic feet in the sales of gas, the receipts from this source were only slightly more than in the previous year. It would be remembered that the scale of charges was reduced and took effect from October, 1912, and this was equal to a reduction of 2d. per 1000 cubic feet. On the total quantity of gas sold during the past year, the reduction in price would mean a decrease of over £3000. But in comparing the two past years, it should be borne in mind that the whole of the sales during the last year had been at the reduced prices, while in the previous year the reduction was only in operation for six months. This difference alone reduced the income by £1350 below what it was last year. Then there was the sale of residual products, from which they received over £19,000. Their income on this account was £677 less than in the previous year. For coke and ammoniacal liquor the prices realized had been more favourable, but less quantities had been sold. For the other residuals, the prices had not been so good; the market having shown a constant tendency to decline. Turning to the expenditure side of the account, Mr. Brockhouse said the total expenses on the trading account amounted to £52,250, or £2565 more than last year. The chief item causing this increase was the higher price they had had to pay for coal; and on the quantity carbonized during the year, this alone amounted to nearly £2400. With regard to the profit and loss account, the interest and sinking fund charges amounted to no less than £8955, which included part of a year's charge on account of the new installation of vertical retorts. The net profit remaining was £1238, which sum the Committee proposed should be carried forward. The Committee had incurred capital expenditure of nearly £15,000 during the year. They felt certain, however, that they had been justified in their attempt to bring the works more up-to-date, and that the increased efficiency of the undertaking would show itself in the financial results of the future. Unfortunately the gas undertaking had to carry a heavy load of capital charges; and the Committee trusted that the ratepayers and gas consumers would appreciate the fact that, while the net profits were less than the previous year, and there was no grant in relief of the rates, yet they had been relieved to no less an extent than £3000 a year by the reduction in the price of gas, in addition to another £1000 in connection with the public lighting of the town.

The report was adopted.

WORKINGTON CORPORATION GAS SUPPLY.

A Record Year.

The Gas Engineer and Manager of the Workington Corporation (Mr. Horace Chamberlain) has presented his report for the year ended the 31st of March last. It is accompanied by a working statement, which shows that the total make of gas was 121,690,000 cubic feet, or 6·03 per cent. more than in the preceding year; the make per ton of coal and cannel being 11,768 cubic feet, compared with 11,549 cubic

"Kent" Cooker on adjustable stand.

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feet. The total quantity of gas sold by meters was 100,532,600 cubic feet, compared with 93,766,100 cubic feet. The make of residuals per ton of coal was: Coke and breeze, 13·5 cwt., of which 9·27 cwt. was saleable; tar, 10·86 gallons; and sulphate of ammonia, 17 83 lbs. Accompanying Mr. Chamberlain's report is one by the Borough Treasurer (Mr. John Noble), which shows that the gross profit was £2446, compared with £3773, or £1327 less; and that the net profit was £928, against £2225—a decrease of £1297 This is more than accounted for by the reduction of 2d. per 1000 cubic feet in the price of gas, the falling-off in the value of residuals, and the increases in the cost of coal and wages. A sum of £650 has been transferred to the old district fund; and this leaves a profit of £278 for disposal.

The reports were submitted to the Town Council at their monthly meeting last Tuesday, when their adoption was moved by Alderman Hall. In doing so, he said they had carbonized more coal, had a greater yield of gas per ton, and had sold more than in any previous year. The quantity sold came to £300 more than before—again fully justifying the idea of the Council and the Gas Committee that it was always wisest and the best way to put a commodity into the hands of the people at the cheapest possible price consistent with good working. Alderman Hall said this was the seventh year he had had the honour of presenting the accounts of the gas undertaking. In the year prior to his taking the position of Chairman of the Committee, the gross profit was £3817; and if the price of coal and other conditions then obtaining had ruled in the year just closed, the profit would have been £8655. In 1906 they had a debit suspense account of £3683, which had been entirely wiped out, and they were now in a better position by £5159. During the last three years, in addition to the £650 ordinarily contributed, they had given no less than £2278 to the rates. Had the yield of gas per ton of coal been the same as in 1906, the gross profit would have been only about £500, which would have been insufficient to pay interest and sinking fund charges. It was rather a remarkable thing that the whole of their increased earnings—caused by spending money on improved plant and extra supervision and attention—and more, had gone at one swoop into the hands and pockets of the coal-owners. It seemed to him that unless they could be met in a more generous spirit by the coalowners of the district, it simply meant that they were working for them and not for the benefits which ought to go to the town. He and the Committee were quite satisfied that the interests of the town in the Gas Department were in safe and capable hands—those of Mr. Chamberlain, their Engineer and Manager. The reports were approved.

PENRITH GAS-WORKS EXTENSIONS.

Local Government Board Inquiry.

At Penrith, on Thursday last, Mr. R. H. Bicknell, M.Inst.C.E., held an inquiry in regard to an application made to the Local Government Board by the Penrith Urban District Council for authority to borrow £7000 for gas-works improvements and extensions. Part of the scheme is for the installation of mechanical stokers, which it was claimed would increase the make of gas by 500 cubic feet per ton of coal, and save £400 a year in labour. Mr. A. A. Marriner, a local Magistrate, urged that the extensions were not warranted by the demand. Mr. W. Johnston, an ex-councillor, asserted that the time was not opportune to carry out so large a scheme, as the Council might have to buy up the Electric Light Company. He also objected to mechanical stokers, which, he said, had not been a success elsewhere, and would do away with labour. Mr. H. Taylor, the Secretary of the Trades Council, argued that the scheme was brought about by the fact that the men had recently obtained an increase of wages and better conditions of work, and the idea seemed to be to give to them with one hand and take away with the other. The Inspector said he had nothing to do with labour troubles. He was there to see that the scheme was an engineering one, and that the Council were in a position to pay for it. They had full power to do what they pleased with their profits It might or might not be a good thing to transfer them to the general district fund; but if the Council in their wisdom decided that they should be so used, he was sure the Local Government Board would not interfere.

NOTTINGHAM STREET LIGHTING.

Improvements Effected.

Recent criticism has had the effect of rousing the Nottingham Corporation Lighting Committee into a condition of renewed activity. The reason for indifferently illuminated streets has been largely accounted for hitherto by the limitations placed upon financial resources; but with the increased revenue now voted by the Council those responsible for arrangements find themselves in a position to effect some long-delayed improvement. It is in the direction of a more extended use of the high-pressure system that the Committee are now proceeding; and, though the rate of progress has been slow, some substantial advances have been made. The Committee's annual report, which has just been presented to the Town Council, records also that they are still extending the use of automatic lighting and extinguishing apparatus, which continues to act very efficiently. These appliances are now attached to 554 lamps. A high-pressure lighting installation is being carried out in two thoroughfares contiguous to the Midland Railway. The work has been rendered possible by the laying of high-pressure mains by the Gas Committee; and it was intimated that when similiar mains have been put down in other streets the opportunity will be taken of extending this system of lighting. The report of the Lighting Superintendent (Mr. Carter) shows that the number of lamps of all kinds in use at the end of March was 5465—an increase of 103 on the year.

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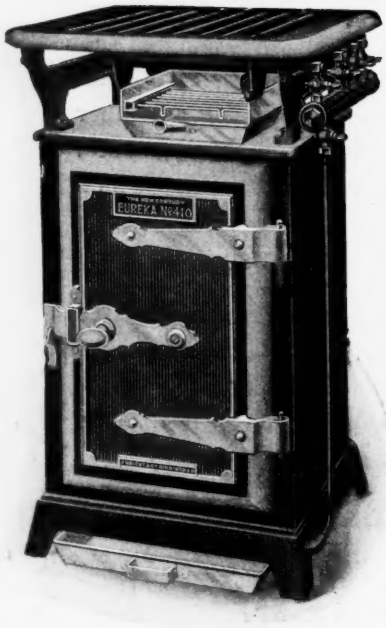

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LANCASHIRE GAS-WORKERS' WAGES.

An Increase of £120,000 in one Year.

In his biennial report, Mr. J. R. Clynes, M.P., the Secretary of the Lancashire District of the National Union of Gas-Workers and General Labourers, says: "In the past two years our progress in membership and money, and our record in securing good results for members have far exceeded those of any period of greater length in the previous history of the district. The income at the end of last quarter shows that the size of the district has been nearly doubled in the course of the two years. In addition to this form of growth, we find that membership and contributions are more steady than formerly, and there is a greater activity in the branches, and an increased interest in the conduct of the affairs of the Union. . . . The instances where considerable groups of men have obtained better wages are: Manchester, Stockport, Buxton, Birkenhead, Oldham, Warrington, Blackburn, Burnley, Bolton, Colne, Bury, and Fleetwood. In a great many other places smaller groups have secured substantial benefits. A careful estimate of the yearly value of the increased wages secured is £120,000. . . . It will be seen from a comparison with other figures that the wage gains in a year are worth to our members £100,000 more than the total sum they paid to the Union in two years. . . . Many of our disputes have been due to provocation arising from the long delay of employers in dealing with claims, and to men finding themselves ignored until they could compel attention. . . . We may add, however, that some troubles have arisen from ill-considered action on the part of the members, who have not waited for the guidance and authority of their Union in pressing their claims in proper form. We would advise members to avoid doing anything which, if done by employers, we would strongly condemn. . . . A strike should not be started until there is cause for it; nor even threatened until men find themselves strong enough to carry out their threat with their Union behind them."

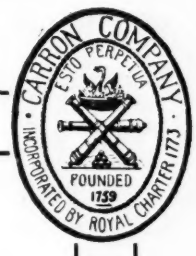
WEARDALE AND CONSETT WATER SUPPLY.

Dissatisfaction in the District.

A conference of representatives of local authorities within the area served by the Weardale and Consett Water Company was held at Consett last Wednesday, for the purpose of considering what steps should be taken to meet the emergency occasioned by the present shortage of water, and to ensure safety in the future. There were some seventy delegates; and Mr. G. T. Hyden, of Consett, presided. The conference was convened at the instance of the Consett Urban District Council, whose Clerk (Mr. Horswill Jackson) undertook the secretarial work in connection with it. He submitted a letter he had forwarded to the Company, calling their attention to the notice issued by them curtailing the supply of water by meter by 75 per cent. as from the 18th of May, and stating that the Council could not regard the shortage of water this notice revealed otherwise than as a most serious matter. They acknowledged that the curtailment of supply did not as yet affect water needed for domestic use; but it was evident that if an efficient supply for all purposes could not be maintained to-day, no great increase could safely be made in the domestic demand. The Council regarded the matter as one of the greatest importance, and they had instructed him to report thereon to the Local Government Board. To this letter the Secretary of the Water Company (Mr. G. R. Tyrman) replied. He expressed the regret of the Directors at the shortage of water, which had occurred owing to the long drought extending over more than twelve months. He pointed out that for some years the consumption for manufacturing purposes had not only not increased, but had decreased; and from all information the Directors had been able to obtain, it seemed probable that the reduction in requirements for manufacturing purposes was likely to continue, and that there would therefore be a larger quantity of water available for domestic use to provide for the increasing requirements, as new houses were built. If, however, the water-carriage system was substituted generally for earth-closets in the district served by the Company, this would mean an enormous increase in the quantity of water required for domestic purposes; and it opened up an entirely new problem. A matter of this kind could be much more easily and fully explained verbally than in a letter; and, if the Council thought it desirable, a Committee of the Directors would meet a deputation from the conference.

The Chairman, having referred to the gravity of the situation, remarked that upon a regular and full supply of suitable water for domestic, manufacturing, and public purposes the health, employment, and prosperity of a community largely depended. Some of them had experience of the ill-effects of a water famine, and it behoved them to leave no stone unturned to prevent a recurrence. Having quoted some figures in regard to the Company's sources of water, as furnished by them to the Local Government Board, he said they appeared to give a supply of only 13 gallons per head per day, while statistics to hand showed that in the London area the consumption averaged from 32 to 38 gallons per head per day. It had been estimated that the increased consumption likely to result from the provision of water-closets would be about 10 gallons per house per day; and from various particulars obtained from other districts, it might be taken, on a rough estimate, that the water used for trade was from one-third to one-half the total consumption.

Various resolutions were submitted, and it was unanimously decided that the attention of the Company should be formally called to the serious position of the district caused by their failure to make adequate provision for the storage and supply of water; and intimating that the conference would meet the Directors, as suggested, and would be willing to go into the whole question.



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NOTTINGHAM CORPORATION WATER SUPPLY.

Weighted with a financial incubus from the City's participation in the Derwent Valley scheme, from which it would gladly welcome relief, the Nottingham Corporation Water Committee find themselves with considerably depleted resources. The surprise, even to those intimately concerned in the management, is that, after meeting the heavy annual contribution due under the joint compact with the three other municipalities concerned, anything should remain in the way of net profit. But, through a process of rigid economy and a re-adjustment of rates, this result was attained in 1913; and according to the report which was presented at yesterday's meeting of the Council, it has been further enhanced during the twelve months just concluded. Whereas in the year 1909 the profit amounted to £13,649 only, in 1913 it had risen to £24,703, being a net profit of £3993 after providing for the contribution of £20,710 to the Derwent Valley Water Board's exchequer; while in the year just closed the profit had increased to £29,828, there remaining a net available balance of £5669, after meeting the Derwent liability of £24,158. The Committee record with gratification the fact that for the fourth year in succession the water undertaking was carried on without any addition to its capital expenditure; indeed, a slight reduction on capital account was noted. It is the desire of the Committee to avoid as long as possible further expenditure on capital account; and, with this object in view, all outlay on new mains, &c., has been met out of the renewals fund for the past four years. This year the amount debited to the fund on account of new mains, services, and meters is £1966. During the year the workmen's wages were advanced in all grades. The steady decline in the building of new houses in Nottingham continued; this necessarily entailing a serious handicap upon the prosperity and progress also of the water undertaking. The number of new houses supplied on the average of five years to 1911 was 1649; for the year 1912 it fell to 1194, for 1913 to 852, and for 1914 to 744.

The Engineer and General Manager (Mr. F. W. Davies) in his annual report, stated that the estimated population within the parliamentary water limits supplied on March 26 last was 372,978; and the population of the parishes supplied in bulk through meters outside the statutory area is estimated to be 4000. During the past year 509,420,000 gallons of water were supplied by the Dewent Valley Board, and distributed within the city and outside districts. In consequence of complaints of the action of this water on wrought-iron pipes and fittings fixed in domestic hot-water installations, the supply was shut off at Langley Mill on March 27. The question of the special treatment of the water is receiving very careful consideration. The total capacity of the various reservoirs is 13,845,058 gallons. Of this quantity only 11,829,808 gallons were avaitable during the past year. In view of the present small storage being further reduced, the Committee, Mr. Davies points out, must take steps to provide, without delay, the necessary storage independent of the existing reservoirs. The effects of colliery workings are still felt in the parishes between Eastwood and Papplewick, and fractured mains and services constantly call for attention. The total quantity of water distributed from all sources during the year amounted to 3,037,807,213 gallons. The average quantity sent out weekly was 58,259.313 gallons; being equal to an average of 8,322,759 gallons per day. The total length of additional distributing mains laid during the year was 3518 yards. The number of new supplies was 4004; the total on March 27 being 157,339, made up of 140,906 domestic and 16,433 trade.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

The effect of the introduction of the high-pressure gas-lamps in Edinburgh by the Edinburgh and Leith Corporations' Gas Commissioners is shown by the decision of the Electric Light Committee of the Town Council to recommend the lowering of the price for lighting the public roads by arc lamps from £9 to £7 18s. each. It will be remembered that the Commissioners decided to make a charge of £7 per lamp for high-pressure gas; so that the figure fixed by the Electric Light Committee does not come down so low as that for the gas-lamps. When the comparative light given by the two systems is taken into consideration, a difference in price is all the more remarkable. It is, however, the evident concern of the Electric Light Committee that will be most interesting to gas people. If, as the electricians are so fond of asserting, high-pressure gas is not to be compared with electric lighting, why have they decided in this instance to reduce the price from £9 to £7 18s.? It is when the purse is affected that we learn the truth; and in this question of gas or electric lighting the electrical advocates clearly see that their revenues are about to suffer, and high-pressure gas is to be used in place of electric lamps, unless the price of the electricity is brought much nearer to that of gas.

Mr. Soutar, the Treasurer, has presented the accounts of the Gas Department of Dundee to the Law and Finance Committee, who unanimously approved of them. It appears that the gross income has been £146,719, which is £3391 in excess of last year. This was made up of an increase in the gas sold, amounting to £4163, or 34 million cubic feet, and coke and residual products £718; but there has been a decrease in the sulphate of ammonia returns of £377, and in those for tar of £907. During the past two years the increases in the price of coal have added £25,000 to the coal bill, while last year alone accounted for £9847 of this increase. Despite this fact and the lower price ruling for residuals, £4169 only was the balance to net revenue account less than the previous year. This is partly accounted for by the fact that the net expenditure, apart from the coal, has been a 1d. per 1000 cubic feet less than the previous year. This is a very satisfactory result, of which Mr. Yuill may be justly proud. The Broughty

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Ferry accounts, however, have resulted in a debit balance of £787, and, consequently, the net debit balance amounts to £6377 odd, which was carried forward to next year. Owing to the insistence of the Secretary for Scotland, an additional sum of £5090 has had to be carried out of revenue for the sinking fund of the year. The estimates for the coming year are: Gas required, 1137 million cubic feet; total income, £158,126. A saving in expenditure is estimated of £6005 on coal, oil, and manufacturing charges, and £862 on other manufacturing items. The price has been retained at 2s. 2d. This has been rendered possible owing to the purchase of coal being at an average price of 13s. 5½d. per ton, as against 16s. 2d. last year.

The forty-fifth annual meeting of the Buckie Gaslight Company has been held under the presidency of Mr. John Dawson, the Vice-Chairman. The report recommends a dividend at 6 per cent. on the ordinary shares, less income-tax; while £340 has been written off buildings and plant—leaving £65 to be carried to profit and loss account. To further the development of the sale of gas and extend the Company's district, and for carrying out other improvements in the works, the Directors propose to arrange for an enlargement of the capital. The increase in the consumption of gas has been considerable. The report was adopted.

There has been some discussion in the Banff Town Council regarding the increase in the cost of the public lighting, which has risen about £30 over last year. It was, however, pointed out that the repairs, owing to accidents, amounted to £13 in the latter season, and also half the cost of new meters. It was pointed out that the town by these meters were paying for the actual gas they were consuming, whereas previously the quantity had been estimated. The Gas Company had also asked for a revision of the previous agreement, by which revision the cost to the town would have been greater than the increase shown by the meters. The Burgh Surveyor suggested that it was not necessary to light the street lamps on Sunday evenings, when the moon was shining, and pointed out that by this means at least £5 per annum could be saved.

Mr. Henry Salmond, Assoc.M.Inst.M.E., has been giving a demonstration at the Tradeston Gas-Works, Glasgow, of the utilization of oxygen, with ordinary coal gas, for welding metals such as aluminium, cast iron, copper, or steel. The plant is a very simple one, consisting only of a blow-pipe or converter connected to the ordinary gas-main, and an oxygen cylinder. The demonstration was given in the presence of representatives of the leading engineering firms in Glasgow, and no doubt by the use of such an apparatus the increase in the output of the Corporation Gas Department will be assisted. The figures for the output for last year to May 31 amounted to 8,112,616,000 cubic feet, which is an increase of 461,000,000 over the previous year, and the largest output on record.

The Provost of Cowdenbeath brought forward a motion at the last meeting of the Town Council to adopt and apply to the Burgh the Burghs Gas Supply (Scotland) Act, 1876. A Committee, after careful consideration, were convinced that the adoption and application of the Act would be beneficial to the ratepayers. The motion was unanimously agreed to. The required second meeting to resume consideration of the resolution was fixed for Thursday, Nov. 19.

The annual report of the Directors of the Leven Gas Company shows that the sales of gas have risen by £1210 to £8900, while the profits on residuals were also larger. Coals cost over £1000 more than the previous year. They recommended paying a dividend of 10 per cent., and a bonus of 2½ per cent., while carrying £500 to the reserve fund and £1387 forward. The profits amounted to £4057, which is the highest ever obtained by the Company.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *June* 8.

Pitch is nominally 37s. net in bulk. Creosote is 3⅜d. to 3⅞d. per gallon net in bulk at works, and is in good demand. Crude carbolic 60° remains at 1s. 2d. per gallon in casks. Pyridine bases are 8s. 6d. to 8s. 7½d. in buyers' drums. Ninety per cent. benzol is 1s. 2d.; 90 per cent. toluol, 11d.; 90-160 solvent naphtha, 10¾d.—all net and naked. Anthracene, 45 per cent., minimum, is 2d. per unit, casks free.

There has been more inquiry for sulphate of ammonia during the past week, and the fall seems to have been arrested. Buyers will not, however, pay more than £10 5s. for 25 per cent. minimum, filled into buyers' bags at sellers' works.

Tar and Tar Products in the Provinces.

June 8.

The average values during the week were: Tar, 24s. 3d. to 28s. 3d. Pitch, east coast, 33s. to 34s.; west coast, Manchester, 31s. 6d. to 32s. 6d.; Liverpool, 32s. 6d. to 33s. 6d.; Clyde, 32s. 6d. to 33s. Benzol, 90 per cent., naked, North, 10d. to 10⅛d.; 50-90 per cent., naked, North, 10d. to 10⅛d. Toluol, naked, North, 10¼d. to 11d. Crude naphtha, in bulk, North, 4⅜d. to 5d. Solvent naphtha, naked, North, 9¼d. to 9½d. f.o.b. Heavy naphtha, naked, North, 9d. to 9⅛d. f.o.b. Creosote, in bulk, North, 3⅛d. to 3⅜d. Heavy oils, in bulk, 3⅜d. to 4⅛d. Carbolic acid, casks included, 60 per cent., prompt, east and west coasts, 1s. 1d. to 1s. 1⅛d. Naphthalene, £4 10s. to £10; salts, 55s. to 60s., bags included. Anthracene, "A" quality, 1⅛d. to 1⅜d.; "B" quality, nominally, ¾d. per unit, packages included and delivered.

Sulphate of Ammonia Prices in the Provinces.

LIVERPOOL, *June* 6.

For the first few days of the week the market was of a holiday character, and even in the second half the inquiry for this article has been small. Consequently there has continued to be a drooping tendency, and the nearest values at the close are £10 11s. 3d. per ton f.o.b. Hull,

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£10 12s. 6d. per ton f.o.b. Liverpool, and £10 15s. per ton f.o.b. Leith. There is naturally no improvement in the situation as regards future delivery, and it is reported that £10 17s. 6d. f.o.b. good port has been accepted by makers for July-December; moreover, that they are offering October-March at £11 per ton without finding buyers.

Nitrate of Soda.

The market for this material still remains without alteration; the spot quotation being 9s. 10½d. and 10s. 1½d. per cwt. for ordinary and refined quality respectively.

From another source it is reported that the market for sulphate of ammonia has again gone lower; and judging by the large quantities offering, it is considered that the lowest price has by no means been reached. Outside London, makes are offering at £9 17s. 6d. to £10; Hull, £10 12s. 6d.; Liverpool, £10 13s. 9d. to £10 15s.; Leith, £10 15s.; Middlesbrough, £10 12s. 6d.

COAL TRADE REPORT.

Northern Coal Trade.

There is now a steady demand in the coal trade, and shipments are good except to some of the Spanish ports—the latter having labour troubles. In the steam coal trade, best Northumbrians are from 14s. 6d. to 14s. 9d. per ton f.o.b.; while second-class steams are about 11s. 6d. up to 12s. 3d. per ton. For steam smalls, the demand is fair; and the quotation is 7s. 3d. to 8s. 6d. per ton, according to the quality. Production is fairly good, but will be checked by the great local holidays before the end of the month. In the gas coal trade, the demand is good for this season and short nights. Best Durham gas coals are from 13s. 3d. to 13s. 6d. per ton for early delivery; second-class gas coals are about 12s. 3d. to 12s. 6d. per ton; and "Wear specials" are near 13s. 10d. to 14s. per ton—all f.o.b. Tenders are being sent in for the Bergen gas coal supply—some 2000 to 3000 tons monthly. The Newcastle Gas Company's contracts, and those for South Shields, are in course of arrangement; and it is probable that the price will be about 1s. 6d. to 1s. 10d. below that of the past year. For Christiania, it is believed that the prices will be 12s. 4½d. to 12s. 6d. per ton f.o.b. for best Durham; but official figures are not readily given. A number of smaller contracts are in course of negotiation. Coke is steady and somewhat scarce. Gas coke is rather firmer at 13s. to 13s. 6d. per ton f o.b. in the Tyne. The exports of gas coke have been heavier of late.

In the "JOURNAL" for April 21 (p. 202), it was stated that contracts had been concluded for 60,000 tons of Durham gas coal for the Western Gas Company of France, at the price of 25 frs. 50 c. per ton delivered at St. Nazaire. We understand, from a letter received from the Syndicat Professionnel de l'Industrie du Gaz, of Paris, that the price paid was 22 frs. 40 c. per ton on truck at St. Nazaire.

Advantages of Cooking by Gas.

The following is from the "Food" number of "The Times," which appeared yesterday: "The common coal gas of our fires and kitcheners is the best friend of the man or woman who wishes to prepare food—the body's fuel—in the most perfectly tasteful and easily digestible form. This is rapidly becoming recognized, not only on account of its convenience, but of its cleanliness and its reliability, its ready obedience to the touch of a tap or turn of a lever, its cheapness when service and other costs are taken into account, to say nothing of its saving of space and of time, temper and energy. One word must be said as to the use of gas cooking in our residentual schools of all grades. Children are frequently out of their homes for at least seven of the most important years of their growing and developing lives; and not one but many of our leading sanitary and medical authorities—notably, Dr. Clement Dukes, of Rugby, and Dr. Hutchinson, of the London Hospital—have of late years called urgent attention to the need of the good cook and the good cooker. Nearly half the battle is in the fitting-up of the kitchen. If antiquated fittings were removed, in many cases antiquated methods would disappear with them, the meals would be uniformly and tastefully cooked, served hot, and, as in the case of the private kitchen where gas has replaced coal, the cook would be able to give her mind to the cooking instead of dividing her attention between cooking and stoking. . . . The modern cleanly gas-cooker is bound to play a more and more important part, whether it is bringing decent cookery within the reach of the working man and his family by means of the penny-in-the-slot arrangement which worries him by no bills, or in serving the silver grill of the exclusive club or elaborate restaurant, which makes it possible for the epicure of to-day to realize his superiority over his primitive ancestor in at least one particular."

Reduction in Price at Brighton.—A reduction of 1d. per 1000 cubic feet has been made by the Brighton and Hove Gas Company; this being the second concession of the same amount within twelve months. The price is now 2s. 8d. per 1000 cubic feet.

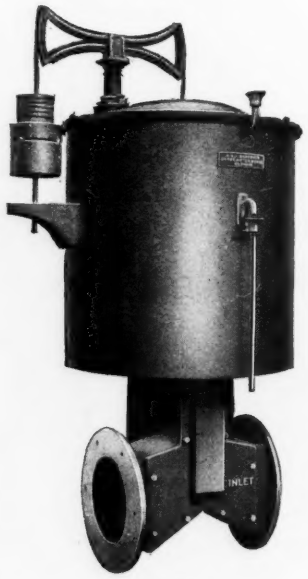
Morley Gas-Works Results.—The annual report of the Morley Corporation Gas Department, submitted to the Council last week by the General Manager (Mr. H. J. Hemingway), showed total receipts for the past financial year of £21,546, an increase on the previous year's figures of £349. The expenditure was £13,833, an increase of £777, leaving a gross profit of £7713, compared with £8141. After deduction of interest and contribution to sinking fund, the net profit was £851—showing a reduction of £342. The sales of gas amounted to 111,268,900 cubic feet, an increase of 3,000,000 feet over those of 1912 and 1913—two years which were affected by the coal strike. The increase over 1911 is 1,080,000 cubic feet. Sales for heating and motive power showed an increase of 900,000 cubic feet. The expenditure on coal was £8029, an increase of £1021.

BRADDOCK'S RETORT-HOUSE GOVERNORS

HAVE PROVED TO BE SECOND TO NONE.

Many repeat orders have been received.

Braddock's New Patent Retort-House Governor is a further improvement and is especially desirable for use with Vertical Retorts.



No. 284.
Braddock's New Patent Enclosed Retort-House Governor, Latest Type.

Further Particulars upon Application.

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Telegrams: "METRIQUE, LONDON." Telephone No. 2412 HOP.

Stafford Gas Working Analysis.

Attached to the accounts of the Stafford Gas Department for the twelve months ended March 31 is an analysis by Mr. W. M. Valon, the Engineer and Manager. This shows that at the date named the capital was £32,602, or at the rate of £1 9s. 6d. per ton, or 2s. 9d. per 1000 cubic feet of gas sold. The coal carbonized, and its equivalent in oil and coke, was 22,070 tons; the gas made being 248,716,000 cubic feet; and that sold 237,904,241 feet. The make per ton was 11,269 cubic feet; and the quantity unaccounted for, 2·82 per cent. The coke made per ton of coal carbonized (less breeze) amounted to 12·25 cwt.; the sulphate of ammonia, to 21 lbs. The net proceeds of the residuals equalled 71·11 per cent. of the cost of coal. The net profit was £4576, which was equal to 4s. 1·77d. per ton of coal carbonized, and 4·617d. per 1000 cubic feet of gas sold.

Concession to Prepayment Consumers at Hereford.—The Hereford Town Council have agreed to a recommendation of the Gas Committee to reduce the price of gas 2d. per 1000 cubic feet to prepayment meter users—making a discount of 10d. per 1000 feet from the gross charge, instead of 8d. as hitherto.

Cheaper Gas at Blackpool.—The Finance Committee of the Blackpool Corporation have approved a proposal that the price of gas should be reduced by 2d. (to 2s.) per 1000 cubic feet. An alternative proposal, that the price should remain at 2s. 2d., and that any surplus should be used to carry out improvements in various parts of the town, was defeated.

High-Pressure Gas Lighting at Chorley.—At the last meeting of the Chorley Gas Committee, it was resolved that the question of the supply of high-pressure gas, and the laying of the necessary mains for street-lighting and shop-lighting purposes be postponed until January next; and that in the meantime the Gas Manager (Mr. J. W. Allin) be authorized to experiment in high-pressure gas lighting with lamps in front of the fittings and stove show-room, and other selected places.

Lincoln Water Supply —The report submitted by the Water Committee of the Lincoln Corporation at the meeting of the City Council last Tuesday showed that the income for the past financial year amounted to £30,684, compared with £29,859 for 1912-13—an increase of £825. The working expenses came to £10,173, compared with £9392, or £781 more; leaving the balance to transfer to net revenue account £20,511—an increase of £44. The charge for the supply of water for domestic purposes was the same as in the previous year—2s. 4d. in the pound for the city, and 3s. 4d. outside. The income from this source showed an increase of £245; while the income from meter supply, &c., was £580 more. The total capital expenditure to date was £421,761; being £164,297 on the old works, £250,357 on the new ones, and £7107 the cost of the Act of 1908.

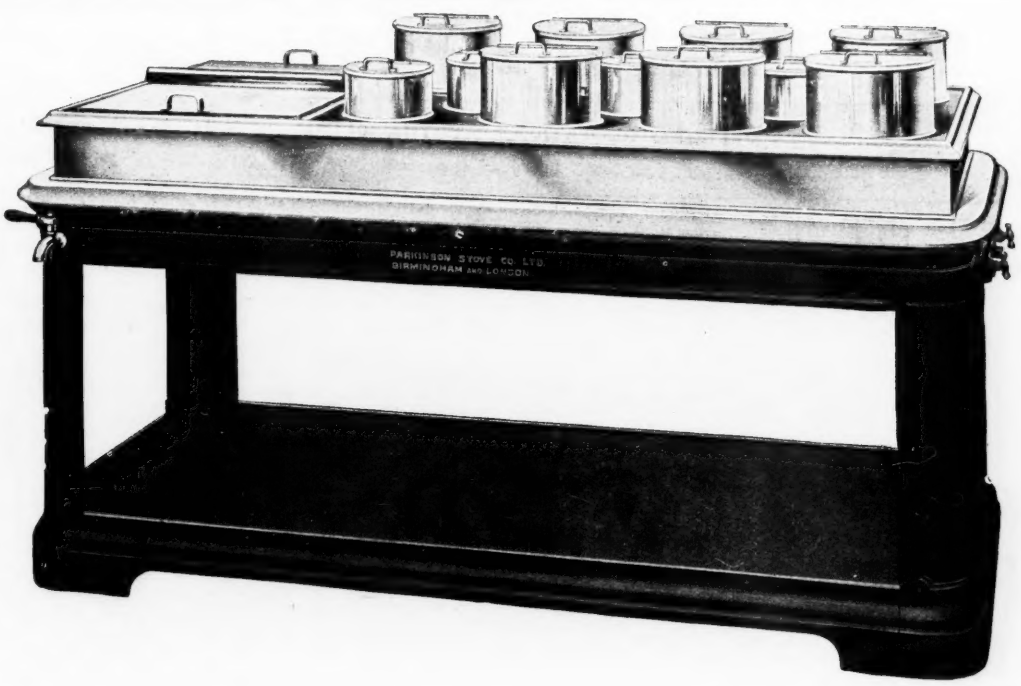
Lyttelton (N.Z.) Gas Supply.

The annual report of Mr. L. A. Stringer (Town Clerk of Lyttelton, N.Z.) shows that, for the year to March 31, the revenue of the gas undertaking, as per the profit and loss account, was £5081, and the expenditure £4246—leaving a profit of £835, equal to 14·73d. per 1000 cubic feet. To be added to this, there was a profit on fittings of £171, making a total of £1006. The increasing demand for gas necessitates the laying of larger mains and the provision of further storage accommodation. In his statement, the Gas Engineer (Mr. W. M'Auliffe) states that the increased sales last year, compared with the preceding twelve months, amounted to 8·37 per cent.; while the make of gas per ton was slightly more, at 12,310 cubic feet. There were connected during the year 57 new consumers. When the works were taken over by the Municipality in December, 1902, the yearly make of gas was 5 million cubic feet, with 227 meters in use; whereas last year the make was 15¾ millions, with 743 meters in use—and this with a practically stationary population. In the interval, the price of gas has been reduced from time to time.

Electric Cable Box Explosion.—There was an explosion on Sunday morning in one of the electric cable boxes outside the National Gallery, which caused some excitement. With a loud report, the iron cover was lifted into the air; and there was a rush of flame and smoke. Sand was employed to extinguish the outbreak; and consumers supplied from the fused cables were not long cut off. The explosion, it was explained, was due to a short-circuit.

Lytham Gas Undertaking.—The make of gas at Lytham for the past year was 96,700,000 cubic feet, which was an increase of 4,291,000 feet as compared with the preceding twelve months. There was a net profit of £1256, which, together with £351 taken from the reserve fund, has been applied towards defraying the cost of additional work in connection with the new vertical retort installation and in the erection of stores, &c., rather than for the Council to be obliged to apply for another loan.

Lecture on Gas-Furnaces at Glasgow.—Last Saturday week, in the Corporation Demonstration Rooms, Milan Street, Glasgow, an interesting and instructive lecture, on the application of gas-heated furnaces in relation to various metallurgical processes, was delivered by the Gas Heating Inspector, Mr. John M'Isaac. The chair was occupied by Mr. Ralph Halkett, the Commercial Superintendent of the Distribution Department. The "paper" dealt primarily with the application of gas-furnaces to five processes: Annealing, case-hardening, hardening, tempering, and metal melting. At the close of the lecture questions were put by many of the audience—among the points touched upon being the cost of gas as a fuel against that of oil and solid fuels. Lecturer and Chairman both received cordial votes of thanks, which they suitably acknowledged.



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Gas v. Electricity Profits at Nottingham.

Compared with the record profits derived in the past financial year from the sale of gas at Nottingham, to which reference has been recently made in the "JOURNAL," the results attending the working of the Electricity Department of the Corporation for the same period appear of moderate proportions, as revealed by the annual report of the Committee, presented at a meeting of the Corporation yesterday. It is explained, however, that the demands for electricity still continue, and extensions of the mains have been carried out from time to time to meet the requirements of new customers in various parts of the City. Naturally the demand for power in connection with the tramways now constitutes one of the main features of the undertaking, representing 5,359,804 units during the past twelve months; the number of units used for lighting having been 3,976,184, and for power for general purposes 3,294,852. Of the units employed for private lighting, 29·45 per cent. were charged at the flat-rate of 3½d. per unit; while 61·52 per cent., supplied on the maximum demand system, were at the reduced price of 1½d. per unit. In 1895, the first year of the undertaking, the number of units sold was 62,879; and the average price obtained per unit was 5·97d.; whereas last year the number sold was 12,630,840, and the average price was 1·81d. As in the larger department of the local municipal service, the higher price of coal during the year has been felt—there having been an increase of 1s. 9d. per ton in the cost for four months and 6d. per ton for eight months as compared with last year; the total additional cost being £2357, or equal to 0·045d. per unit.. The expenditure on the undertaking to March 31 last had been £482,344. On the past year's working, there was a balance carried to the net revenue account of £41,216; the reserve fund now amounting to £55,066.

In connection with a scheme for making further use of streams in the Nidd Valley, in increasing the water supply to the city, the Bradford Water Committee have recommended the acceptance of the following tenders for the construction of intake conduits: Pipe-line and other works, Messrs. Morrison and Mason, £25,097; cast-iron pipes and special castings, the Stanton Iron-Works Company, £34,212; steel pipes, Stewarts and Lloyds, £15,235.

We have received from the Lennox Foundry Company, Limited, of New Cross, S.E., their second catalogue of "Tantiron" specialities. The material named is claimed to be the first real acid-resisting alloy ever put upon the market. It is hard, close-grained, and silvery white, melts at about 1200° C., and can be treated exactly like cast iron. It does not rust or oxidize, nor, it is stated, is the metal attacked by ordinary corrosives to any significant extent. It will resist hydrochloric acid. Many new forms of apparatus and plant have been devised since the issue of the previous catalogue; and they are effectively shown in the one under notice.

GAS COMPANIES IN THE STOCK EXCHANGE.

After the bright period prior to closing for the Whitsuntide holiday which the Stock Exchange enjoyed, it was highly disappointing when, upon the resumption of business last week, all the brightness had faded away and a very gloomy and depressing state of things prevailed from start to finish. Apart from the old familiar factors of depression—such as Ulster and Labour unrest—heavy clouds of anxiety emanated from Paris and St. Petersburg, where the pressure to sell securities became almost past endurance. But, in addition to this, the continuous realization at home went on and on, and culminated in the suspension of a large and once powerful firm. Their difficulties had for some time past been "talked about," and the crash did not come unexpectedly. A feeling of relief was felt when the worst was known; and markets on Saturday closed calmer than they had opened. But, on the week, all showed losses; that of Consols being ¾ after allowing for *ex div.* variation. The opening on Tuesday was very quiet; and markets were weak. Continental selling put Consols down ¼, Rails were dull in view of labour difficulties, Transatlantics lacked support, and Foreign were uneven. On Wednesday, flatness ruled all round; foreign affairs in both hemispheres causing trouble. Consols went back ¼, and practically all the rest were more or less in sympathy. Thursday was a disappointing day. It began resolved to be cheerful; money being easier, and a fair amount of buying being in evidence. But in the afternoon unfavourable symptoms set in, and selling became the order of the day. Consols receded, and Rails lowered all round. But Transatlantics were helped up on that side; and Foreign had one or two good points. The prevailing tendency on Friday was very flat, with pressure to sell both at home and abroad; Paris being the focus of disturbance in the latter instance. Markets in general showed prices crumbling away. Government issues were weak; the fall in Consols being partly attributable to a new Canadian loan. On Saturday, depression reached its lowest depth when the failure of Messrs. Chaplin was announced. Consols touched 73½ more than once, and closed at 73⅛ to 73⅜. In the Money Market, easier conditions ruled. Business in the Gas Market was quiet, though not to such a degree as the preceding week, and it was fairly evenly distributed. The general tone was uniformly firm, and changes in quotation were few and slight. In Gas Light and Coke issues, the ordinary was sparsely dealt in at firm prices—all within the range of 101⅜ and 102⅛. In the secured issues, the maximum fetched 78 and 78¼, the preference 97½, and the debenture 74½. South Metropolitan was quiet and firm at 110 to 111, and the debenture rose ½. In Commercials, the 4 per cent. realized 106½, and the 3½ per cent. 103⅜ and 105. Among the Suburban and Provincial group, Alliance and Dublin changed hands at 63, Bournemouth "B" at 15½ (a rise of ½), Brentford old at 263 and 264, ditto new at 206 to 208½, British at 44½, South Suburban at 114 and 115½, and (on the local Exchange) Liverpool "B" at 144½—a rise of 1. In the Continental companies, Imperial made 162½ to 164, ditto debenture 85½, European 18 and 18⅜, and Malta 4⅜. Among the undertakings of the remoter world, Monte Video marked 11½ to 11⅝, Oriental 118¼, Primitiva 6 to 6 3/16, ditto preference 5 to 5⅛, and San Paulo preference 10½—a fall of ¼.

OFFICIAL QUOTATIONS AT THE CLOSE OF THE WEEK.

Bank Rate (fixed January 29), 3 per cent. Last year, 4½ per cent. Consols, 73½—73¾.* Previous week, 74⅞—75⅛.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	61—66	..	3 15 9
374,000	,,	Jan. 15	4	Do. 4 p.c. Deb.	73—81	..	4 12 9
280,000	5	April 29	7½	Bombay, Ltd.	5⅞—6⅜	..	5 17 8
50,000	10	Feb. 26	16	Bourne- } 10 p.c.	29—30	..	5 6 8
352,500	10	,,	7	mouth Gas } B 7 p.c.	15—15½	+½	4 10 4
75,000	10	,,	6	and Water } Pref. 6 p.c.	13¾—14	..	4 5 9
380,000	Stk.	Feb. 26	14	Brentford Consolidated	260—265	..	5 5 8
330,000	,,	,,	11	Do. New	204—209	..	5 5 3
50,000	,,	,,	5	Do. 5 p.c. Pref.	109—111	..	4 10 1
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	207—212	..	5 3 9
244,200	,,	,,	8	Do. A Ord. Stk.	153—158	..	5 1 3
530,000	20	Mar. 26	12½	British	44—45	..	5 11 1
120,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. Stk.	90—92	..	4 7 0
245,771	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	89—91	..	4 7 11
100,000	10	—	—	Cape Town & Dis., Ltd.	1½—2½	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	5—7	..	—
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	73—78	..	5 15 5
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord.	108—110	..	4 10 11
1,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106—108	..	5 1 2
560,000	,,	,,	5½	Do. 3½ p.c. do.	103½—105½	..	5 1 1
475,000	,,	Dec. 11	3	Do. 3 p.c. Deb. Stk.	71—73	..	4 2 2
800,000	Stk.	,,	4†	Continental Union, Ltd.	80—83	..	4 16 5
200,000	,,	,,	7	Do. 7 p.c. Pref.	117—122	..	5 14 9
492,270	Stk.	—	6	Derby Con. Stk.	123—125	..	4 16 0
55,000	,,	—	4	Do. Deb. Stk.	102—104	..	3 16 11
1,002,180	10	Jan. 15	10	European, Ltd.	18—18½	..	5 8 1
16,386,660	Stk.	Feb. 12	4/17/4	Gas } 4 p.c. Ord.	101—103	..	4 14 7
2,600,000	,,	,,	8½	Light } 3½ p.c. max.	76—79	..	4 8 7
4,062,235	,,	,,	4	and } 4 p.c. Con. Pref.	96—99	..	4 0 10
4,674,850	,,	Dec. 11	3	Coke } 3 p.c. Con. Deb.	73½—75½	..	3 19 6
258,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87—89	..	5 12 4
70,000	10	April 29	11	Hongkong & China, Ltd.	16½—16⅝	..	6 11 4
131,000	Stk.	Mar. 12	7⅜	Ilford A and C	151—154	..	4 19 0
65,780	,,	,,	6½	Do. B	115—118	..	5 3 10
65,500	,,	Dec. 30	4	Do. 4 p.c. Deb.	94—96	..	4 8 4
4,940,000	Stk.	May 14	9	Imperial Continental	162—167	..	5 7 9
1,235,000	Stk.	Feb. 12	8½	Do. 3½ p.c. Deb. Red.	84—86	..	4 1 5
200,242	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c.	119—121	..	5 7 5
561,000	Stk.	Feb. 26	10	Liverpool United A	211—213	..	4 13 11
718,100	,,	,,	7	Do. B	144—146	+1	4 15 11
306,083	,,	Dec. 30	4	Do. Deb. Stk.	99—101	..	3 19 8
63,480	Stk.	Dec. 30	3	Maidstone 3 p.c. Deb.	65—67	..	4 9 7
75,000	5	Dec. 11	6	Malta & Mediterranean	4⅜—4⅞	..	6 3 1
250,000	100	April 1	4½	Met. of Melbourne } 4½ p.c. Deb.	99—101	..	4 9 1
541,920	20	May 28	4	Monte Video, Ltd.	11⅜—12¼*	..	6 13 1
1,775,892	Stk.	Feb. 26	4½	Newc'tle&G'tesh'd Con.	99½—100	..	4 10 0
529,705	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	83½—84½	..	4 2 10
55,940	10	Feb. 26	7.14.0	North Middlesex 7 p.c.	13½—14½	..	5 6 2
300 000	Stk.	May 14	8	Oriental, Ltd.	117—122	..	6 11 2
60,000	5	Mar. 26	10	Ottoman, Ltd.	7¼—7⅜	..	6 9 0
60,000	50	Feb. 26	12	Portsea, Island B	128—131	..	4 19 3
100,000	50	,,	12	Do. C	119—121	..	4 19 2
249,980	5	April 29	8	Primitiva Ord.	6—6½	..	6 3 1
499,960	5	Dec. 30	5	,, 5 p.c. Pref.	5—5½	..	4 15 3
521,600	100	June 2	4	,, 4 p.c. Deb.	91—95*	..	4 6 0
346,198	Stk.	Dec. 30	4	River Plate 4 p.c. Deb.	87—89	..	4 9 11
150,000	10	May 14	6	San Paulo { 6 p.c. Pref.	10½—11	−¼	5 9 1
125,000	50	Jan. 2	5	{ 5 p.c. Deb.	48—50	..	5 0 0
135,000	Stk.	Mar. 12	10	Sheffield A	223—224	..	4 9 8
209,984	,,	,,	10	Do. B	222—224	..	4 9 3
523,500	,,	,,	10	Do. C	222—224	..	4 9 3
90,000	10	May 28	9	South African	10½—11½*	..	7 16 6
6,429,895	Stk.	Feb. 12	5/9/4	South Met., 4 p.c. Ord.	109—111	..	4 18 6
1,895,445	,,	Jan. 15	3	Do. 3 p.c. Deb.	73½—75½	+½	3 19 6
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	157—159	..	5 6 11
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114—116	..	5 3 5
60,000	,,	,,	5	Do. 5 p.c. Pref.	110—112	..	4 9 3
117,058	,,	Dec. 30	5	Do. 5 p.c. Deb. Stk.	113—115	..	4 6 11
629,740	Stk.	May 14	5	Southampton Ord.	99—102	..	4 18 0
120,000	Stk.	Feb. 12	7⅜	Tottenham { A 5 p.c.	135—138	..	5 6 10
543,940	,,	,,	5⅞	District { B 3½ p.c.	115—117	..	5 0 5
149,470	,,	Dec. 30	4	{ 4 p.c. Deb.	89—91	..	4 7 11
182,380	10	,,	5	Tuscan, Ltd.	5—6	..	8 6 8
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	95—97	..	5 3 1
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½—109½	..	4 11 4
				Wandsworth, Wimbledon, and Epsom—			
80,000	Stk.	Feb. 26	8½	Wandsworth A 5 p.c.	151—156	..	5 7 4
255,636	,,	,,	6⅞	,, B 3½ p.c.	129—134	..	5 2 7
108,075	,,	,,	5/17/3	,, C 3½ p.c.	110—115	..	5 2 0
359,000	,,	,,	6½	Wimbledon 5 p.c.	117—122	..	5 0 5
98,000	,,	,,	6⅝	Epsom 5 p.c.	121—126	..	5 5 2
88,416	,,	Dec. 30	3	3 p.c. Deb. Stk.	68—71	..	4 4 6

Prices marked * are "Ex Div." † Next Dividend will be at this rate.

A man named Terry committed suicide at Fulham by placing his head inside a gas-oven with the gas turned on, presumably because he had been unable to work since his release from an asylum some years ago.

At the annual meeting of the Uckfield Gas Company, a dividend of 5s. per share (less income-tax) was declared; and the Directors were authorized to borrow a sum not exceeding £1500 by the issue of debentures. The profit for the past year, divisible among the proprietors, amounted to £548.

At a meeting of West Bromwich Town Council, the Chairman of the Electricity Committee (Mr. W. N. Halford) was asked whether it was not a fact that electricity was being sold to manufacturers in the borough at less than cost price. Mr. Halford said this was a very nice financial question; and he would not answer it without consideration. He thought proper notice should have been given of such an important question.

Lead wool is perfectly well known to many readers of the "JOURNAL," and its properties have been tested by them in main-laying operations. Those who desire to become acquainted with its uses and advantages may profitably consult the latest catalogue of the Lead Wool Company, Limited, of Snodland, Kent, in which they will find information in regard to the constitution of the material, and full particulars as to its employment. Lists are given of some of the users of lead wool for jointing gas and water mains—the former under both ordinary and high pressure. The value of the catalogue is greatly enhanced by the inclusion of a number of useful tables relating to mainlaying.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

ELECTRICIAN AND MECHANIC. Stretford Gas-Works.
WORKS SUPERINTENDENT. No. 5893. Application by June 15.
WORKS MECHANIC. No. 5891.

Appointments, &c., Wanted.

MANUFACTURING ENGINEER (Meters, &c.) No. 5894.
TRAVELLER. No. 5895.

Plant, &c. (Second Hand), for Sale.

EXHAUSTERS. Coal Distillation Company, Middlesbrough.

Gas-Works Wanted.

"D. G.," c/o Scripps's Advertising Offices.

Gas Apparatus, &c.

AMERICAN RIGHTS, &C., WANTED. No. 5890.

Meeting.

INSTITUTION OF GAS ENGINEERS. St. George's Hall, Liverpool. June 16, 17, 18.

Patent Licences, &c.

REGULATORS FOR WATER-HEATERS. F. Bosshardt and Co., 4, Corporation Street, Manchester.

Sales of Stocks and Shares.

BRENTFORD GAS COMPANY. London Mart. June 16.
BROADSTAIRS GAS COMPANY. London Mart. June 16.
CLEETHORPES GAS COMPANY. Yarborough Hotel, Grimsby. June 19.
HERNE BAY GAS AND ELECTRICITY COMPANY. London Mart. June 23.
ROCHESTER, &C., GAS COMPANY. London Mart. June 16.
SOUTH SUBURBAN GAS COMPANY. London Mart. June 30.
SOUTHEND WATER COMPANY. London Mart. June 23.
SOUTHGATE GAS COMPANY. London Mart. June 23.
WORTHING GAS COMPANY. London Mart. June 23.

TENDERS FOR

Coal.
ASHFORD URBAN DISTRICT COUNCIL. Tenders by June 18.
CARDIGAN GAS COMPANY. Tenders by June 19.
DAWLISH GAS COMPANY.
DEWSBURY GAS DEPARTMENT. Tenders by June 20.
EAST DEREHAM URBAN DISTRICT COUNCIL. Tenders by June 29.
GAINSBOROUGH GAS DEPARTMENT. Tenders by June 20.
HINCKLEY GAS DEPARTMENT. Tenders by June 20.
MACCLESFIELD GAS DEPARTMENT. Tenders by June 16.
PONTYPRIDD URBAN DISTRICT COUNCIL. Tenders by June 23.
TEIGNMOUTH URBAN DISTRICT COUNCIL. Tenders by June 29.

General Stores (Lime).
HINCKLEY GAS DEPARTMENT. Tenders by June 20.

Lamps, Columns, &c.
CALCUTTA CORPORATION. Tenders by July 20.

Pipes, &c.
NEW MILLS U. D. C. Tenders by June 9.

Retorts, &c.
LYMM URBAN DISTRICT COUNCIL. Tenders by June 22

Tar and Liquor.
MACCLESFIELD GAS DEPARTMENT. Tenders by June 16

BOOKS AND LEAFLETS

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Payment will be made when Delivery is accepted.

Tenders will be received by the Vice-Chairman of the Corporation up to 2 p.m. on Monday, July 20, 1914, when they will be opened in the presence of such Tenderers as may be present.

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No Tenders will be considered unless accompanied by a Remittance to the extent of 2½ per cent. on the Total Value of such Tender.

The Rates offered by the Tenderers will be in force for the whole Year.

Tenderers must abide by the Rules in regard to Tenders in vogue in the Corporation.

C. C. CHATTERJEE,
Secretary to the Corporation.

Municipal Office,
May 14, 1914.